

GROUP TESTS

150 Notebooks

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Your Internet-security checklist

Online shopping has gained a reputation for being **cheap and easy**, but it's not all a bed of roses.

Watch out for the thorns



The world wide web is fast becoming a world wide marketplace. There's almost nothing that you can't buy online and many people are finding that buying over the web can be cheaper as well as more convenient. Because the

Internet has no knowledge of countries, it's as easy for you to buy something from Australia as it is to order it from your local high street.

I regularly purchase items online. Being an avid film fan I buy a lot of DVD movies, but I don't want to wait until the films are released in Europe before I buy. The web is the ideal answer to this problem. Not only can I buy the discs cheaper from the US or Canada, but I also get them months before their European release. I also buy parts for my mountain bike, again saving a significant amount on the UK retail price, not to mention being able to track down items that are hard to find locally. All this is done from the comfort of my home or office – and the goods are delivered directly to me, without the need to wander around the high street.

The Internet has become a simple way to attract customers, without the need for high-cost marketing. If you are offering something that people want, customers will inevitably start to appear. Unlike regular marketing or advertising, customers don't need to have heard of your company to find it. Anyone who is interested in the products you sell will search for companies on the Internet that deal in such goods.

A prime example of this is car-import companies. Unless you've been avoiding the news for almost a year, you'll know that consumers in the UK pay well over the odds for new cars compared to the rest of Europe. To take advantage of this situation, many companies have sprung up that will import cars from the European mainland and sell them to UK customers, and what better place to advertise their wares than on the web.

Having recently decided to purchase a new car I did exactly what these companies want and searched the web for 'European car imports'. After a matter of minutes I had tracked down several import dealers and

asked for quotes to be sent to me. A week or so later and I'd struck a deal for a brand new car built to UK specifications, complete with manufacturer's warranty. And what had my few minutes of web surfing saved me? Just over £3,000 off the UK list price. Nothing to be sneezed at I'm sure you'll agree.

But before I have everyone thinking that the Internet is a shopper's Utopia, it's not all a bed of roses. Back in August 1999 my wife and I decided that we wanted to go to Thailand in February 2000. Being a very organised type of person, my wife instantly started searching the web for suitable accommodation. Eventually we found a mutually agreeable hotel and booked our stay.

Once the booking was confirmed we thought very little about it until we started looking for flights in January 2000. We emailed the hotel to check a couple of details and were told that they had no record of our booking. Without getting too angry I sent a copy of the booking confirmation we had received several months before. The reply we received was nothing short of

And what had my few minutes of web surfing saved me? JUST OVER £3,000 off the list price – nothing to be sneezed at I'm sure you'll agree

stunning. A woman emailed us back and told us that the girl who had booked us in was no longer working at the hotel and that the room had since been double booked. She continued to tell us that even though the other couple booked after us, she wasn't willing to tell them because she had handled their booking and it would be embarrassing for her.

At this point I lost my temper completely, but what could I do? Even though as a customer I had been treated appallingly, the other party was on the other side of the world. I couldn't fly over to Thailand and demand that they give us our original booking, but if I had booked it at a high-street travel agent that's exactly what I have done.

So, shopping online may be the way forward, but it isn't perfect. However, if you're careful, I feel that the pros definitely outweigh the cons.

Riyad Emeran, Editor

Editorial

Riyad Emeran **Editor** · riyad_emeran@vnu.co.uk
 Nik Rawlinson **Deputy Editor** · nik_rawlinson@vnu.co.uk
 Clive Akass **Associate Editor (News)** · clive_akass@vnu.co.uk
 Niall Magennis **Features Editor** · niall_magennis@vnu.co.uk
 Jason Jenkins **Staff Writer** · jason_jenkins@vnu.co.uk
 Will Head **Staff Writer** · will_head@vnu.co.uk
 Claire Morley **Editorial Assistant** · claire_morley@vnu.co.uk
 Editorial Phone 020 7316 9315 Fax 020 7316 9313 website www.pcw.co.uk

Production/Art

Debbie Oliver **Production Editor** · deborah_oliver@vnu.co.uk
 Matt Chapman **Senior Sub-editor** · matthew_chapman@vnu.co.uk
 Matt Whipp **Sub-editor** · matt_whipp@vnu.co.uk
 Stuart James **Art Editor** · stuart_james@vnu.co.uk
 Chris Dias **Assistant Art Editor** · chris_dias@vnu.co.uk
 Ciaran Bradley **Graphics**

Publishing

Shane McCracken **Associate publisher** · shane_mccracken@vnu.co.uk
 Martin Hill **Publishing Director** · martin_hill@vnu.co.uk
 Ruud Bakker **Chief Executive**
 Brin Bucknor **Managing Director**
 Tosh Bruce-Morgan **Financial Director**
 Angelo Zgorelec **Founder**

Marketing & Circulation

Zoe Rouch **Marketing Manager** · zoe_rouch@vnu.co.uk
 Jonathan Hardy **Newstrade Circulation Manager** · jonathan_hardy@vnu.co.uk
 Gaynor Silsbury **Subscriptions Marketing Executive** · gaynor_silsbury@vnu.co.uk

Advertising

Sean Ferris **Head of Sales** · 020 7316 9246
 Tom Wright **Account Manager** · 020 7316 9529
 Amanda Dorrington **Account Manager** · 020 7316 9834

Portfolio Account Handlers

Anis Qizilbash 020 7316 9306

PC Consumer Sales

Nunzio Mosca 020 7316 9305 · Jim McGinty 020 7316 9295
 Ian Carrington 020 7316 9773

Micromart Sales

Gillian Wilson 020 7316 9435
 Victoria Robinson **Issue Manager** 020 7316 9523
US Sales Representation Global Media USA, LLC, 565 Commercial Street, 4th floor, San Francisco, CA 94111-3031 Tel: 001 415 249 1620 Fax: 001 415 249 1630 www.globalreps.com
European/Asian/Middle East Representation Global Media Europe Ltd, 32-34 Broadwick Street, London W1A 2HG Tel: 020 7316 9638 Fax: 020 7316 9774 www.globalreps.com
Taiwan Sales Representatives Grace Chu/Kent Lai 001 886 2717 7663

Central Production

Stav Athanasiou **Group Production Controller** 020 7316 9227
 Xenia Antoni **Production Controller** 020 7316 9486
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New Media

Steve Rogers **CD Editor**
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Wisse Hettinga **European Labs Manager** · Gordon Thorn **UK Labs Manager** · Alan Rider **Operations Manager** · Labs Phone 020 7316 9064 Fax 020 7316 9059

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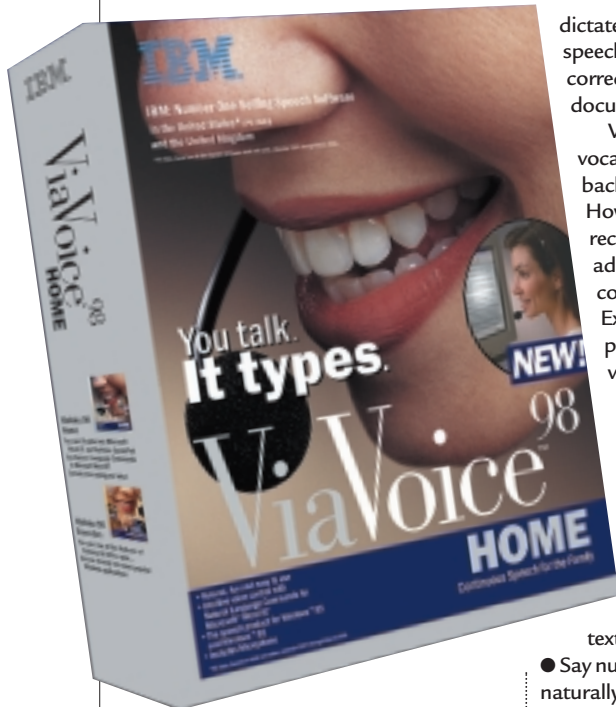
ENTERTAINMENT

INTERNET

This month we have the full version of IBM ViaVoice 98 Home, putting top-quality speech recognition on your desktop for free, plus MS Office 97 Visual Guide and more

IBM ViaVoice 98 Home

FULL VERSION



For the first time on any magazine, we've got a full version of the world's best-known speech recognition software – IBM ViaVoice 98 Home – absolutely free and unrestricted on this month's cover CD. Plus, you can try out the latest version – IBM ViaVoice Millennium Standard Edition – for 30 days, and there's a special exclusive upgrade offer for *Personal Computer World* readers.

You talk, it types! The computer translates your words and phrases into actions that carry out commands or create text. IBM ViaVoice 98 Home could change the way you use your computer, by allowing you to dictate text and control your computer by voice. Imagine yourself sitting at your desk and you want to send a letter to a friend. Say 'Dictate to SpeakPad'. A word processor called SpeakPad opens, and you

dictate your letter using continuous speech. You can proof-read, make corrections, format text and print your document – all with your voice.

ViaVoice comes with a base vocabulary of 64,000 words and a backup dictionary of 260,000 words. However, if you want ViaVoice to recognise even more words, you can add up to 64,000 words through correction and the Vocabulary Expander tool – creating your personal vocabulary – and any Topic vocabularies available.

Key features:

- Dictate directly into Microsoft Word 97 (not 2000), or into ViaVoice SpeakPad and transfer dictated text into your favourite Windows-based word processor or email application
- Correct, edit and format your text with ease, as you dictate
- Say numbers, dates, times and currencies naturally; they are formatted automatically for you as you speak
- Use dictation macros to insert standard paragraphs such as a letter 'sign-off block'
- Use everyday language to format documents, create tables and edit text in Microsoft Word 97, using Natural Language Commands
- Play back your dictation in your own voice to help you make corrections
- Have your text or email read back to you with ViaVoice Outloud text to speech.

According to IBM, you can dictate to ViaVoice at up to 140 words a minute, which is fast for dictation to shorthand, but relatively slow compared to normal speech (newsreaders speak at around 140-150 words a minute). However, with a recognition rate of approximately 90 per cent from the first time you use it, and this is a rate which improves with training, it is a

package to be reckoned with. When it was first released *PCW* gave it five stars and concluded, 'Well worth investing in'.

Since the CD offers a full previous version of IBM ViaVoice software, readers can reach the highest levels of productivity in speech recognition technology by upgrading to ViaVoice Pro Millennium Edition for a reduced price (see the offer box on page 13). In order to upgrade, the free version of ViaVoice 98 Home which is on this CD will need to be installed.

Alternatively, IBM ViaVoice Standard and IBM ViaVoice Web can be purchased from a number of leading specialist computer stores and the computer departments of many high-street stores as well as on the web.

You can install IBM Via Voice 98 Home direct from the *PCW* CD-ROM menu, but before taking the plunge it is worth stepping back for a moment and understanding some of the fundamentals of speech recognition software and the necessary hardware requirements. One of the basics is having a microphone! And for those of you without this essential piece of equipment, there is a special offer for *PCW* readers on page 18 – remember, desktop microphones were not designed to be used with speech recognition programs.

DETAILS

PLATFORM Windows 95/98

LIMITATIONS Full version

SYSTEM REQUIREMENTS Pentium 166MHz (or equivalent), 256KB (or more) L2 Cache, 32MB RAM for Windows 95/98 (48MB if dictating into Word 97), 48MB RAM for Windows NT4 (64MB if dictating into Word 97), 180MB available hard-disk space, Windows-compatible 16bit sound card, double-speed CD-ROM drive

SALES CONTACT 01475 555 047

IBM ViaVoice Millennium Standard Edition



IBM ViaVoice Standard is part of the next generation of IBM's award-winning and best-selling family of speech-recognition products. It is the fast and easy way to create letters, homework and emails on your PC. Relax and enjoy talking, not typing!

This software was covered in our voice-recognition feature in the January issue. It employs a comprehensive, wizard-led installation and enrolment routine, and obtaining good recognition scores hinges on optimising this audio input. The program emphasises correct microphone positioning and even provides video clips to help you.

Enrolment is a key element in the speech-recognition process, and ViaVoice offers a variety of enrolment sessions, some as long as 60 minutes. We chose a 15-minute lesson, containing 88 sentences, but this was completed in just 10 minutes, with a four-minute data analysis period. Additional training is recommended, however.

On top of all this, ViaVoice offers a document analysis facility for augmenting dictation vocabularies. It has an 'Analyse Document' option that searches documents for unknown words.

ViaVoice also supports multiple users

and these were all easy to set up. ViaVoice delivers recognition accuracies that would have been astonishing a mere 12 months ago. Reading out a weighty business report of 160 words would typically result in only four errors – 97 per cent accuracy.

Our test of 'Peter Piper picked a peck of pickled peppers', posed no significant problems for ViaVoice, although it had trouble with 'peck'. However, after training that word, it managed the tricky phrase.

It's important to correct mis-recognised words – if you don't, the package assumes it has got it right and will repeat the mistake. So, the ease with which corrections can be made is important. ViaVoice Millennium has a Correction window you can keep open.

The Pro version of ViaVoice supports command and control, which allows you to control the Windows desktop or any Windows application, by saying the menu names and menu choices. The software offers its own speech-enabled WordPad look-alike for simple dictation tasks, but it can also input dictation directly into a range of major Windows applications. All the major players are supported, such as Microsoft Office 97 & 2000, Corel WordPerfect 8/9 and Microsoft Outlook 97/98/2000.

Generally, if you say what's on a menu, then that task will be actioned – you can dictate and issue commands in the same breath. Simply parroting the menu structure can be a very stilted way of working, but ViaVoice employs natural language commands (Pro version only).

For example, to change the font size in Word, you would have to say 'Format, Font, Size' – with natural language, you highlight the word or letter and say 'make it larger' or 'increase the font size by one point.' All natural language commands are confined to Office 97/2000 products, however.

Changes

What has changed between ViaVoice 98

IMPORTANT

Both products require the use of approved microphone and sound cards (see headset offer on page 18). Desktop microphones were not designed to be used with speech-recognition programs and will result in poor accuracy levels. When sold, any IBM ViaVoice package consists of a software licensed program, a suitable microphone with built-in speaker, and telephone support free for 30 days.

Home and ViaVoice Standard?

The primary objectives of the ViaVoice Millennium range were to make improvements in the areas of enrolment, accuracy and ease of use. With ViaVoice Standard, a new recognition wizard and a personal assistant – Woody – offer you advice if you need it. Just 'voice type' into SpeakPad, ViaVoice's own fully-featured word processor, to create text for most Windows applications.

With ViaVoice Standard you can:

- Create documents quickly just by talking and without having to worry about spelling. Try saying words that are often spelt incorrectly, such as: consensus, possession and necessary. The software will also differentiate between words that sound the same but are spelt differently. Try these sentences: Please write to Mr Wright right now; I wonder whether the weather will improve tomorrow
- Format text as you dictate, with simple commands such as 'bold on';
- Save time by using short-spoken commands (dictation macros) to insert text, such as letter endings, that you use regularly;
- Make corrections quickly and easily with your voice or your keyboard, with help from the recording of your own dictation;
- Have documents read aloud to you.

Better accuracy

ViaVoice Standard is now more accurate, thanks to its 100,000-word vocabulary (so it already knows about Cybercafe, Tony Blair and Kevin Keegan!) and the program improves every time you use it. ViaVoice can quickly find the words you use from your existing documents to help personalise your vocabulary quickly and easily.

SPECIAL PCW OFFER

Upgrading to ViaVoice Pro Millennium

PCW readers can upgrade from ViaVoice 98 Home to ViaVoice Pro Millennium Edition for the special price of only £58.74 (£49.99 ex VAT) instead of the usual price of £70.49 (£59.99 ex VAT). To take advantage of this offer, readers should phone 08705 810 333 and quote part number BS12222. Please note: ViaVoice 98 Home needs to be installed on your system before installing the upgrade.

For normal product purchase... offer prices are:

IBM ViaVoice Standard:	£35.24 (inc VAT),	normally £39.99 (inc VAT)
IBM ViaVoice Web:	£50.51 (inc VAT)	normally £59.99 (inc VAT)
IBM ViaVoice Pro:	£97.51 (inc VAT)	normally £119 (inc VAT)

The telephone number to use to get these offers is: 08705 801333.

DETAILS

PLATFORM Windows 95/98/NT4 or greater, Pentium II 233MHz, 48MB RAM (other specs as home version)

LIMITATIONS 30-day trial

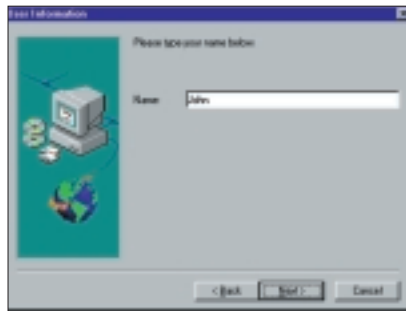
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ViaVoice 98 Workshop – Getting Started

To help you get started, we've included a short tutorial that takes you through the first crucial steps of installing, configuring, enrolling and training your software so that it recognises your voice. It's worth taking the time and getting this bit right, as it will directly affect the accuracy with which you can dictate to your computer.

1 Installing the software

Click the icon on the PCW menu to start the installation, then follow the on-screen instructions. You will be asked to enter your name – this name is the user that ViaVoice recognises whenever you dictate text and speak commands. As you train, add, correct, format or delete words, or when you enroll, ViaVoice changes the personal speech files for this user. The result is improved speech recognition.



If you want additional users, you can add them later by going to the Start Menu and choosing Programs, IBM ViaVoice – UK English, Tools, ViaVoice Options, User.

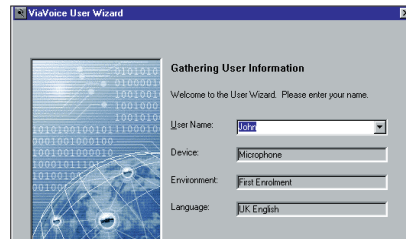
You can select Microsoft Word 97 Dictation Support if you use Office 97 (the program doesn't support typing directly into Office 2000, although you will still be able to use ViaVoice through its own SpeakPad program).

If Adobe Acrobat Reader is not already installed on your computer, ViaVoice automatically starts the Adobe Acrobat Reader installation program. This program enables you to view and print the ViaVoice Command Reference and user manual.

2 Starting ViaVoice for the first time

The first time you run the program, the User Wizard takes you through the tasks you must carry out to set up your audio system and prepare ViaVoice to understand your voice. The first time you or a new user starts the VoiceCentre, the VoiceCentre does not appear immediately. Instead, the User Wizard runs, and the ViaVoice User Wizard dialog appears.

The User Wizard runs the ViaVoice Quick Tour. Then Audio Setup helps you set up your speakers and microphone, and



shows you how to wear the microphone headset and position the microphone. Then, Quick Training introduces your voice to ViaVoice.

3 Audio setup

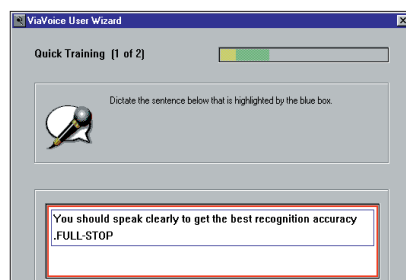
You must wear a microphone headset and position your microphone correctly to get the best performance from ViaVoice. The microphone (with its foam sheath) should be within a thumb's width of the corner of your mouth. The side of the microphone should face your mouth.

DO NOT

- Remove the foam pad from the microphone – it acts as a windscreen;
- Position the microphone in front of your mouth, where it will pick up breathing noises and attempt to interpret them as words.
- Let the microphone touch your face or facial hair;
- Change the way you position the microphone each time you use ViaVoice (for example, positioning it farther or closer).

4 Quick training

The User Wizard runs Quick Training immediately after Audio Setup. Quick

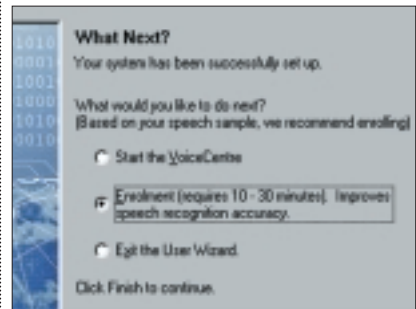


Training lets you dictate a few sentences to introduce your voice to ViaVoice. Be sure to wait until you see the blue highlight box around a sentence before you read it.

When you finish Quick Training, choose what you want to do next:

- **Start VoiceCentre.** If you select this, you can dictate immediately. However, your recognition accuracy might not be optimal. To improve accuracy, select Enrolment.
- **Enrolment.** This is the recommended

option when you have started ViaVoice for the first time. The initial enrolment of 100 sentences requires only 10 to 30 minutes. Full enrolment requires from 40-60 minutes and greatly increases recognition accuracy.



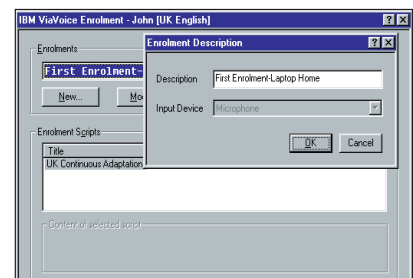
● **Exit the User Wizard.** If you exit now, you can start the VoiceCentre any time by selecting Start, Programs, IBM ViaVoice – UK English, VoiceCentre.

● The first time you start a function in ViaVoice, you will see a Welcome screen containing either categories of information you can branch to or a multimedia tour. Simply go to the information you want, or view the tour to learn more about the feature that you are about to use. To view any of the tours again at a later date, select Start, Programs, IBM ViaVoice – UK English, Help, Multimedia Tours.

5 Creating an enrolment

If your computer desktop has a screen saver, turn it off before continuing with enrolment. At this point of the installation, ViaVoice has already created an enrolment for you called First Enrolment.

If you want a more descriptive name for the enrolment (for example, to describe a laptop you use at home) click Modify and type your own description.



6 Select the correct language

Click UK Continuous Adaptation in the Title area. Click Start and OK in the pop-up that tells you the minimum number of sentences you have to record so that ViaVoice can process (train) your enrolment. The minimum number for UK English is 100 sentences.



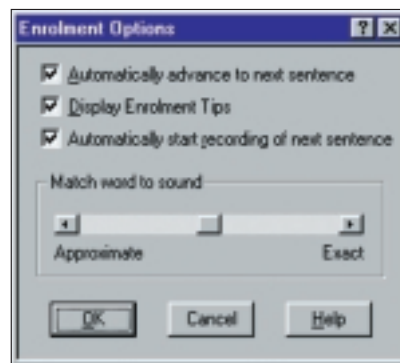
Click Start, wait until you see a blue highlight box around the sentence, and then say the words in a normal speaking voice. Say exactly what you see in the box, including any punctuation marks.

After you record a sentence, ViaVoice will automatically move to the next sentence.

If a sentence turns red after you say it, the sentence was not recorded, and it will not be counted in the total number of recorded sentences. A window pops up to give you tips on how to correct the problem.

When a sentence turns red, read the Enrolment Tips, then choose one of the following options:

- Click Playback to listen to your dictation and determine whether you spoke the sentence clearly (and to confirm that the microphone is receiving your words);
- Click Start to record the sentence again;
- Click Options to adjust the way ViaVoice matches your word to the sound it expects.



For example, move the slider to Approximate if you speak with a regional accent or foreign accent.

7 Training ViaVoice to recognise you

When you have completed recording all 100 sentences, the Ready to Train window is displayed.

Clicking Train Now will allow ViaVoice to 'train' itself to recognise your personal speaking style.

After selecting Train Now, minimise the use of your computer and do not turn it

off until ViaVoice has finished training your enrolment.

Rather than selecting Train Now, you may select:

- Continue Script, to continue recording the script. You can select Train (in Step 3 above) anytime you want to stop recording and train the enrolment. The Train button in the Enrolment window is enabled after you have completed recording the initial set of enrolment sentences.

Should you continue enrolment, you can select Suspend and Exit at any time.

ViaVoice keeps track of where you stopped recording and will keep all the sentences that you have successfully recorded.

- Exit to leave enrolment – you can resume enrolment at another time and then train the sentences you have already recorded.

8 Introducing VoiceCentre

VoiceCentre is the control centre of ViaVoice. From VoiceCentre, you can get to anywhere you want to go with a click of your mouse or the sound of your voice.

If, during installation, you chose to place VoiceCentre in your Windows StartUp folder, VoiceCentre starts when you start your computer. Otherwise, you can get into the VoiceCentre by choosing Start, Programs, IBM ViaVoice – UK English, VoiceCentre.

At the top of your screen, the buttons (from left to right) are: ViaVoice button; microphone on/off; sound-level meter; status message area; help button; and user.

Creating enrolments for multiple recording environments

Every enrolment you create is a unique recording of your voice within a particular acoustic environment using a particular kind of microphone. If you plan to use ViaVoice in different locations or with different recording devices, you will want to create an enrolment for each location and recording device. Consider the following examples.

- **Different noise levels.** If you plan to dictate at home, in the office and on the train using a laptop, create three enrolments – one in each situation, to reflect the ambient noise in each location.
- **Transcription device.** If you intend to use a transcription device to dictate while at conferences or on business trips, create an enrolment using that transcription device.
- **Different microphones.** If you use more than one microphone, create a separate enrolment for each microphone to ensure consistent audio quality

Recording a full enrolment

Full enrolment provides the best recognition accuracy. It takes approximately 40 to 60 minutes to record the sentences. As with the initial enrolment, you can exit at any point and continue enrolment another time.

Resuming enrolment

To resume enrolment where you left off:

- a. Click Start, Programs, IBM ViaVoice – UK English, Tools, Enrolment.
- b. Select the enrolment that you want to resume.
- c. Click Start.

Click the ViaVoice button to access the ViaVoice menu (or just say 'ViaVoice Menu'). This button gives you access to most of ViaVoice's features and tools.

For example, to create a document with your voice, select a dictation application from the Dictate To menu (SpeakPad or Word 97). Or, say 'Dictate to SpeakPad' or say 'Dictate to Word' (if Word 97 is on your computer).

9 When you dictate, ViaVoice translates your words into text. You can use your voice to compose, format, correct and edit your document.

To correct your dictated text with your voice, select Show Correction Window from the ViaVoice menu. Or, say 'Show Correction window'.

To proofread your text, select Begin Reading from the ViaVoice menu and listen to a computer-generated voice read aloud your document. Or, simply say 'Begin Reading'.

To set up your microphone or audio input device to work with ViaVoice, select Audio Setup from the ViaVoice menu. Or, say 'Set up my microphone'. A list of ViaVoice-compliant microphones is available online at: www.ibm.com/viavoice.

IMPORTANT NOTE:

To maintain the accuracy of ViaVoice, it will be necessary to run the Audio Setup whenever:

- The acoustics of your current environment have changed;
- Your microphone has changed;
- You have switched to another computer.

To find out more about what ViaVoice 98 can do for you, check out the multimedia tutorials that are included on the CD.

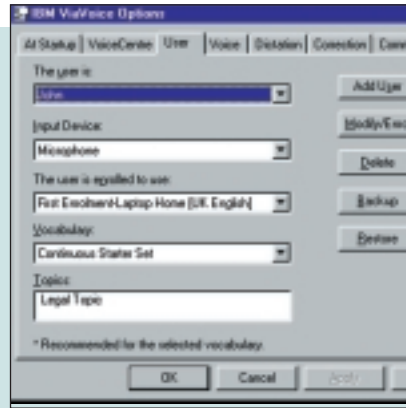
Safeguarding your enrolments and other personal speech data

After each enrolment session and at regular intervals, make a backup of your personal speech files to secure your data and protect the time invested in creating it.

You might need this backed up data in the future when:

- You want to place your personal speech files on another computer
- You need to restore your data because of a computer failure or human error.

A Backup button is available on the User tab in the ViaVoice Options folder.



You can make a back-up of your personal speech files at any time.

Headset offer

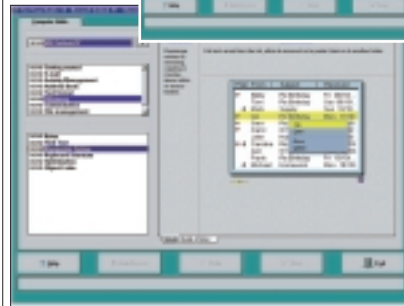
To get the most from ViaVoice you will need to use a good quality microphone headset. So, we're offering PCW readers the chance to buy Labtec's C-315 Boom Microphone headset (normal price £16.99 plus VAT) for just £9.99 plus VAT.

Just phone 08705 801 333 and quote Part Number: E060063 (or www.technomatic.co.uk and product-search "Labtec")



Microsoft Office 97 Visual Guide to Outlook

Even when you've been using, for example, Word or Excel for years, you are probably only using (and familiar with) a small part of the software's powerful features. But, if you were made aware of some of the less-obvious – yet useful and interesting – features, you might be inspired to more



fully exploit the software's potential.

That's what this series of programs from Citron Systems is designed to do. We've included the shareware version of Visual Guide to Outlook 97 on this month's CD. By means of simple animated images and text prompts, you can explore some of the powerful capabilities of Access that you probably weren't already aware of.

You can install Outlook 97 Visual Guide directly from the PCW/CD menu. The first time you run the software you will need to



input a 'shareware key'. This is: VG-pcw (type it exactly as we've printed it here). Then you can click the Run

Shareware button to start exploring the Outlook Visual Guide, fully enabled. Although the program is pretty intuitive, there is online context-sensitive help if you should need it.

DETAILS

PLATFORM Windows 95/98/NT

LIMITATIONS Full version of The Visual Guide to Microsoft Outlook, when you register

SALES CONTACT 0208 451 5253

TECHNICAL SUPPORT

support@visualguide.com

Special offers for PCW readers

Full version – Free licence

To enable your Microsoft Outlook Visual Guide as a fully-licensed version (worth £12.50) simply press the Order button on the software, and this will take you to the Citron Systems website. Once there, fill in the (few) requested details. A licence key will then be emailed to you free of charge, provided your

application is received before 1 April 2000.

Buy one, get one free

The Visual Guide for the whole of Office (Word, Excel, PowerPoint and Outlook) costs just £31.24 (no VAT applies) for purchases over the Internet. As a special offer to our readers, Citron Systems will provide a licence for two users for the price of one, ideal for

you and your partner, colleague or friend. To claim, simply press the Order button on the software, which will take you to the company's website and fill in the details. On completing your purchase and applying the special key that will be emailed to you, press Order again and apply for your free extension. This offer is valid for extension applications received before 1 May 2000.

Gabriel Knight 3



Media kudos, industry awards and a rabid fan base have followed the Gabriel Knight series since its debut in 1994.

Get ready for more of the same – based on a real-life mystery, the most story-intensive



and technologically advanced installment to date is on the way! Join Gabriel Knight and a cast of new and familiar faces on a real-time 3D excursion through a rural European

region brimming with intrigue and ancient mysteries.

Explore the beautifully rendered 3D world of Rennes-le-Chateau,

unlock intricate puzzles and interact with an eclectic cast of characters as Grace

Nakimura, Gabe's witty and cerebral associate. The demo version of Gabriel Knight 3 includes a small portion of the events of Day 2 and the Gabriel Knight 3 graphic novel (requires Adobe Acrobat).

DETAILS

PLATFORM Windows 95/98

LIMITATIONS Level-limited demo version

SYSTEM REQUIREMENTS Windows 95, Windows 98, Pentium 233+, 32MB RAM, SVGA, high colour (16bit), 4x CD-ROM drive, Windows-compatible sound card, DirectX6.1

TECHNICAL SUPPORT

www.sierra.com/support

Paint Shop Pro 6

Specifically designed to meet the needs of both web designers and advanced consumers, Jasc's award-winning Paint Shop Pro continues to provide advanced functionality at a low price. And the latest release – Paint Shop Pro 6 – features a new version of Jasc's popular animation program, Animation Shop 2.

Now Paint Shop Pro gives you more flexibility and editing power than ever before. Paint Shop Pro 6 includes many new powerful design and editing tools for creating websites and enhancing digital images. Key features include:

- Vector drawing tools

- Text on a path
- Fully editable
- Multi-colour Gradient tool
- Digital watermarking for embedding copyright information
- Direct support for over 120 digital cameras
- Enhanced browser for more powerful image management
- Interface enhancements, including roll-up palettes and recent-colours picker
- Enhanced integration between Paint Shop Pro 6 and Animation Shop 2, for better functionality
- Adjustment layers, which allow users to apply colour corrections to multiple layers

- Print Multiple Images function for printing several images on a page
- Improved Layer and ToolOptions palettes for added flexibility and control
- An OLE Screen Capture for grabbing screenshots
- New special effects, including Bevel, Weave, Blinds and more.

DETAILS

PLATFORM Windows 95/98/NT4

LIMITATIONS 30-day licence

SALES CONTACT 01295 258 335

Technical information to help you use the CD

✓ How to use the CD-ROM

Put the disc into your CD drive:
If you've got **Windows 9x** the PCW interactive loader will appear on your screen. If your CD doesn't autoload, go to Start/Run and type in <CD Drive>:\pcw.exe

Windows 3.1 From Windows Program Manager, choose File/Run, then type in <CD Drive>:\pcw.exe and press enter.

✓ Faulty discs

If you have a faulty disc please return it with your name and address, clearly marked 'PCW CD APRIL 2000' to:

TIB plc

HelpLine Returns

Unit 5 Triangle Business Park

Pentrebach

Merthyr Tydfil

Mid Glamorgan CF48 4YB

quoting ref 'PCW Vol 23 No 4'.

A replacement disc will be sent to you.

NOTE: *These cannot be supplied direct from VNU.*

✓ Technical support

If you have technical problems with individual products, please check in the magazine or on the CD for the manufacturer's support contact details. For general problems with the CD, the Technical Helpline is open weekdays from 10:30am to 12:30pm and 1.30pm to 4:30pm on **01685 354726**.

A live technical info page is also available through CDOnline direct from the CD.

✓ Getting software on to the CD

Personal Computer World is keen to promote quality software and would like to hear from you if you are interested in having your product included on a future cover disc. For cover-mount enquiries please telephone Jonathan Hardy on 020 7316 9851 or email jonathan_hardy@vnu.co.uk

IMPORTANT NOTICE

The publisher, VNU, has checked the PCW CD-ROM for known viruses at all stages of production, but cannot accept liability for damage caused either to your data or your computer system, which may occur while using either the disc or any software contained on it. If you do not agree with these conditions, you should not use the disc.

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New chips ignite processor wars

Two chips from secretive startup Transmeta have redrawn the battlelines among processors set to power next-generation mobiles.

The Crusoe TM3120 and TM5400 were launched on 26 January after months of rumours. Interest was high, as Transmeta employs Linux guru Linus Torvalds.

The Crusoes use a Very Long Instruction Word core and cut their transistor count by performing in-software tasks usually hardwired into processors. On-the-fly clock and voltage switching saves further power.

Crusoes use less power than Intel's battery-saving

SpeedStep technology, but their commercial viability will be unclear until system builders test them.

The 0.22micron T3120 will run a special 'mobile Linux' and is designed for palmtops and web appliances. The 0.18micron TM5400 has 256KB on-chip cache and is designed for notebooks.

Both chips pack PCI and 66/133MHz SDRAM controllers; the 5400 also has one for emerging DDR DRAM, clocking 100MHz to 167MHz. Neither includes graphics or audio support – unlike NatSemi's rival Geode chips.

S3, which is designing a multimedia chipset for the Crusoes, has built a TM3120-based web pad that it says lasts 12 hours per charge.

NatSemi questioned the claimed savings of cost and power. Jürgen Heldt, European marketing director for information appliances and networks, said: 'You have to look at the total system.'

This means factoring in the cost and power drain of graphics and audio support, the 16MB of dedicated RAM Crusoes need for software operations and the Flash ROM holding the translation code.

Heldt said processors didn't affect total system power as much as Transmeta estimates (see page 39) and claimed NatSemi's new 0.18micron Geode GX1, sampling in June, would have a 2w edge over the Crusoe TM3120.

Crusoes in detail – pp 38-39
Mobile Linux arrives – p30
SpeedStep Notebook – p86

One Windows for all

Windows looks set to converge into a single speech-driven product as a result of changes at Microsoft, which have seen Bill Gates step down as president.

The company originally intended to merge the 9x and NT lines into Windows 2000, which would give it one code set to work on and would be less confusing for users. Also only one set of drivers would be needed, eliminating the problem of devices working with one version of Windows and not the other.

But the sheer complexity of Win2K proved too much, and a new road map was drawn that led to the release last year of Windows 98 SE. This was to be succeeded by another

9x upgrade this summer called Millennium.

Windows 2000, finally launched on 17 February, was to get a consumer version called Neptune; and an upgrade to the corporate version, codenamed Odyssey, was already being planned. Now Microsoft has confirmed US reports that these two projects have been combined into one – called Whistler.

Millennium will go ahead – as we went to press a report said it will ship on 26 May. A Microsoft spokesman said it was too early to say if Whistler would kill off the 9x line, but it was a possible outcome.

Upgrade aid – p22.
Microsoft in crisis – p40

LOW POWER rivals



TM3120

The Crusoe T3120 pictured above will come in two speeds: a 333MHz at £41 and a 400MHz at £56. Speeds of its sibling TM5400 will range from 500MHz to 700MHz costing between £75 and £206.



StrongARM

Later this year Intel will bring out a version of StrongARM at speeds of 150MHz to 600MHz, consuming between 40mw to 450mw. Supported operating systems include Epoc 32, Java OS and CE. Intel refused to comment on Crusoe, but UK-based ARM, which designed the StrongARM core, said the chips were targeted at different markets.



NatSemi Geode

NatSemi's system-on-a-chip Geodes, costing around £25, are designed for the kind of Windows or Linux-based mobiles targeted by the Crusoes.

short stories

EASY UPGRADE

Companies can ease the transition to Windows 2000 with the aid of a new utility called Desktop DNA, according to developer Miramar. The utility enables desktop settings and other configuration details to be preserved in the upgrade. Each user is presented with a wizard, enabling them to choose what features they want to keep.

Network administrators can then perform multiple automated upgrades. The idea is that users can return to their desk after an upgrade, with all the important features of their setup working just as before.

Miramar CEO Neil Rabin says that DNA version 2.0 is the only system of its kind to support upgrades from Windows 95, 98 or NT.

www.miramarsys.com

ANGER MISMANAGEMENT

One in two users questioned about PC rage admitted reacting to problems by either 'abusing colleagues, hitting the computer, screaming, shouting or hurling parts of the PC.' Symantec, which conducted the survey in 316 small businesses, says it shows PC rage can have 'a detrimental effect on our working lives.'

However, a study by The David Lewis Consultancy says computer use, in particular violent games, can reduce stress levels by allowing people to get rid of their pent-up tensions. Its researchers measured the blood pressure and heart rate of 12 men and found computer games reduced stress levels.

David Lewis claimed: 'It is nonsense to blame computer games for encouraging violence and aggression. Games such as Quake or ones of that genre can act as a cathartic release.'

VNUNET.COM

DIGITAL CAMERAS

Pixels hit new heights

A flurry of 3.3 megapixel digital cameras has been launched after more than a year with definitions static at 2.1 megapixels – once considered by some industry leaders to be the maximum needed by consumers.

The new models offer image sizes of 2,048 x 1,536 pixels, compared to the 1,600 x 1,200 images of 2.1 megapixel models. This allows slightly larger prints to be made, but you won't fit as many images on the same memory cards.

First to launch was Canon with its S20 compact, essentially a 3.3 megapixel version of its S10. The S20 weighs 260g, features a 2x optical zoom, USB interface and 16MB of Compact Flash memory in a CFII slot, also capable of taking an IBM Microdrive hard disk. The S20 is due in April, but the price has yet to be confirmed.

Nikon's new 3.3 megapixel CoolPIX 990 (pictured) shares the split swivel design of the CoolPIX 950, but has a gunmetal finish and a smaller screen – down from 2in to 1.8in. It boasts a new iris-style aperture diaphragm, 3x

optical zoom and a USB interface. The Compact Flash slot has made the welcome move from below the camera

interwoven octagonal pixels – which Fujifilm claims improves resolution, sensitivity and signal-to-noise ratio. The FinePix4700 Zoom has 4.3



(where it was originally blocked by a tripod on the 950) to the side, but sadly this is not CFII-compatible.

The 990 also takes a few leaves out of the CoolPIX 800's book (reviewed last month), with the Best Shot Selector mode and improved battery life. The 990 will be available in May for less than £1,000, but will not replace the 950.

Fujifilm made the most exciting announcement with news of the first two cameras to feature its Super CCD design, using a honeycomb of

megapixels (2,400 x 1,800), 3x optical zoom, USB interface, 16MB of SmartMedia and uses two AA batteries in a 255g package, costing £699 from April.

The FinePix S1Pro, featuring 6.1 megapixels (3,040 x 2,016), has an SLR body that can take Nikon F-mount lenses, and has SmartMedia and CFII slots, for £2,500 from July.

Sony was set to preview 3.3 megapixel models as we went to press, but no details were available.

GORDON LAING

www.canon.co.uk/products
www.nikon.co.uk/cool990.htm
www.fujifilm.co.uk/di
www.sony.co.uk

The hidden cost of cut-price cigs

People buying cut-price cigarettes from non-British sites on the Internet face hefty import charges, Customs officials warn.

Sites on the continent have been offering familiar brands at a fraction of their cost in Britain. But one man who bought 1,000 Marlborough for £100 from a Greek site, faced a bill for £180 from Customs.

A spokeswoman said there were sites in Belgium, Greece



Sites such as this one in the US sell cheap cigarettes, but watch the shipping costs

and elsewhere targeted at British buyers. 'We know where these sites are and we

know the kind of packing they use. People should be warned they could pay more than they think.'

But Customs officials are having a harder time trying to crack down on sales of hashish and marijuana from sites in Holland, where the drugs are tolerated, according to reports.

Trade officials admit that collecting taxes on goods bought over the web will be an increasing problem – with no easy answer.

STORAGE

IT giants agree cheap RAM

Five major memory manufacturers and Intel are thrashing out an architecture for affordable RAM that can cope with the speeds required by emerging fast processors.

Conspicuously absent from the project as announced was RAMBUS, whose fast memory modules have long been promoted by Intel as the way forward for high-end server systems.

But RAMBUS modules are far more expensive than rival technologies, and lost credibility last year, following problems with Intel's supporting 820 chipset. PCs using the 820 are now shipping, but they support a maximum of two RAMBUS modules instead of the four originally specified.

The problem seems to have stemmed from the fact that manufacturers did not keep within RAMBUS' tight tolerance levels. Memory

makers, motherboard manufacturers, and PC makers have been calling for a simpler, cheaper solution – particularly one in which they don't have to pay considerable royalties to RAMBUS.

Samsung, Micron Technology, Infineon, NEC and Hyundai, who between them make seven out of 10 of the world's memory chips, have formed a committee with Intel to agree a specification for advanced DRAM technology (ADT). First products to use it won't hit the market until about 2003.

RAMBUS chips are still

expected to be used in high-end servers, and emerging Double Data Rate (DDR) RAM will help cheaper systems keep up to speed.

Robert Allen, European technical support manager for memory specialist Kingston, said it was the first time Intel had joined a memory consortium of this kind.

Referring to the problems with RAMBUS he said: 'I think they are looking for something easier for people to bring to market.' But he pointed out that RAMBUS was free to join the consortium if it chose.

Holo-storage will oust hard disks

IBM is developing holographic technology in which storage will be measured in yottabytes – or two to the power of 70 megabytes. It claims hard-disk capacities will peak at 100GB within five years, creating a need for

higher capacity fast storage.

Bill Cody, a senior research manager at IBM's Almaden Research Center in California, said the world needed to store 81,000 terabytes in 1995 at a cost of 21p per MB, this rose to 800,000 by 1999 at a cost of 3p per MB; by 2001, six million terabytes will be needed, costing just 0.4p per MB.

'Some 85 per cent of the world's data is currently unstructured and is not accessible using storage technology,' he said. 'But at 0.4p per MB, storage can compete with paper and film.'

Online DIY divorce proves a hit

A site offering legal and mediation advice for couples considering divorce attracted more than 52,000 visitors in its first eight weeks.

Solicitor Roger Bamber set up the site, designed by Strategic Thought, for less than £10,000.

'The aim of this website is to provide a self-help approach... and to encourage mediation at an early stage,' he said.

Free help for number update

Two free utilities are on offer to help computer users through the big phone number changes, which begin on 22 April.

Impreza is offering an update utility for Microsoft Outlook on its website at www.imprezacom.com.

Users of Psion and Ericsson handhelds based on the Epoc operating system can get a utility called FixIt from developer Purple Software's site at www.purplesoft.com.

Any software that autodial numbers, including some web-access numbers, is likely to need tweaking for the changes which include new codes for Cardiff, Coventry, London, Northern Ireland, Portsmouth and Southampton.

New and old numbers have been working in parallel for some months, but from 22 April old numbers will work only if dialled with the full STD code, even from within their own area.

Other codes will be phased out over the coming months. Details are at www.numberchange.org. Or have a look at www.vnu.co.uk/theconnection for Mark Whitehorn's advice on how to update large databases.



You have been warned... ease off on the gas pedal. This Racal Messenger number plate-spotting system uses a Fieldworks FW7000 from Rugged Systems (020 8408 8000) and software from Cambridge-based Neurodynamics.

www.neurodynamics.com



'It says we've hit an unrecoverable application error'

short stories

ECONFESS ALL

You can confess your sins from the comfort of your desktop at a new website opened by London-based Christian Radio. 'This is between you and God, and your privacy is totally respected,' says an introduction to the site, which contains poems, prayers and quotes from the Bible. You can type your confession in the box provided or, if you can't find the appropriate words, use a set confession.

JAN HOWELLS VNUNET.COM

BATTERIES POWER ON

A miniature fuel cell burning liquid methanol to produce electricity, will last up to 10 times longer than existing rechargeable batteries, say co-developers Motorola and the Los Alamos National Laboratory. Products are not expected for three years.

VNUNET.COM

LAST GASP FOR UK FIRMS

The Business Software Alliance (BSA) has declared a 30-day truce from 6 March for UK businesses using illegal software – and offers a free audit tool called GASP to help them check whether they are running any.

www.bsa.org

COMPRESSED ADVERTS

A free compression utility called PowerZip 2000 Lite has followed an emerging trend and is financing itself using banner and button advertising. See www.powerzip.net.

CELERONS SOLD ON

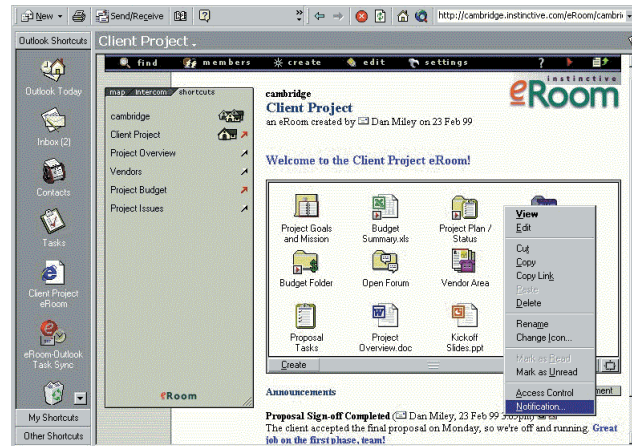
Upgrade specialist Hypertec is offering a £199 kit to upgrade PII PCs with a 466MHz Celeron. The Slot 1 upgrade will be available from PC World stores. Details are available at www.hypertec.co.uk.

NETWORKING

Virtual offices up for rent

Communications networks are redefining human relationships. You're never alone with a mobile phone, and at a networked desk you are always in a crowd. Sophisticated network software can create a virtual group of friends and colleagues with whom you can interact – and even see – throughout the day, despite the fact that they may be dispersed across the globe.

The virtual meeting room takes this idea to its limit, by creating a web space in which people can collaborate on an enterprise. This may be a project or a trade relationship, as business-to-



Applications such as Outlook can be shared within e-Rooms

spreadsheets or project managers, can be accessed and shared – in some cases in real time.

Developers know that such systems will only work if they are very easy to set up and use. Instinctive Technology is one of the first in the field with its e-Rooms product, and company president Jeffrey Beir believes it can revolutionise the way

business is conducted. He claims his firm is two years ahead of Lotus, which launched version 2 of its rival

QuickPlace on 18 January. QuickPlace can be used alone or as part of the Raven knowledge management suite (see p52).

An e-Room can be accessed and used from any browser, but Instinctive provides plug-ins for extra functionality. Both products are currently priced for large or medium-sized companies but they are likely to be available from application service providers. So if you want to set up a virtual company, there will be nothing to stop you renting a virtual office.



PowerPoint at work in QuickPlaces

business commerce is seen as a big potential market. All documents relating to a project, and tools such as

DMA's registry service to cut spam

A scheme to curb spam email has been launched by Britain's Direct Marketing Association (DMA). The scheme is based on similar ones that protect users from junk snail-mail or faxes.

Names of users who register with the DMA's E-mail Preference Service (e-MPS) will be passed on to so-called emarketers and removed from their mailing lists. But the clean-up is voluntary for junk mailers, who have to request the list of names.

'Online marketing is at a critical stage,' said Colin Lloyd, DMA UK chief executive. 'The e-MPS will ensure that the requirements of the Distance Selling Contracts Directive in respect of email communication are met. The DMA wants to ensure that this new and viable means of marketing continues to grow and builds on our mission to maintain consumer trust and confidence.'

However, Internet watchdog EuroISPA, is

sceptical over the scheme's success.

'The email preference service won't solve the problem,' said a spokesman. 'The DMA is stuck with an inability to send commercial email, as it can't differentiate itself from the spammers. This is not the answer to its problems or consumers' problems. With this service, consumers won't know whether the mail they get is from companies who conform to the scheme.'

www.e-mps.org/en

LINUX

Torvalds defends the new Linux kernel, as it misses Windows 2000 date.

Setback for Linux 2.4

The new Linux 2.4 kernel is to be delayed for around six months, the operating system's guru Linus Torvalds admitted in January. It had been set to launch on 17 February – the same day as Microsoft's Windows 2000.

The kernel has to be tested by the open-source software community and product vendors, and will be released around summer, Torvalds told the LinuxWorld conference in New York.

Version 2.4 will add high-end support, scaling to eight processors from the current two, support the USB and FireWire connectivity standards, offer improved graphics

support, and introduce measures to work better with mobile devices. Version 2.2 was released last year.

Torvalds attempted to reassure delegates about the long-term stability of the Linux initiative.

He countered charges that Linux would fragment into competing and conflicting standards, as happened to Unix in the late 1980s and early 1990s, arguing that Linux's modular development allows a high degree of specialisation without dividing into incompatible approaches.

Asked whether there was a chance of facilitating Windows-to-Linux porting,

Torvalds described Microsoft as a 'company I don't care for that much'.

The news came as the trade body of US software vendors declared there was little chance of Linux displacing Windows at the desktop, even if Microsoft is prevented from hindering the market development of the open-source operating system.

The Software & Information Industry Association (SIIA) made the claim in a court submission, backing the US Department of Justice claim that Microsoft has a monopoly hold over the software market.

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short stories

IBM BACKS LINUX

IBM has launched a free application development kit in a bid to boost the use of Linux in ecommerce. The scheme, unveiled at LinuxWorld in New York, includes support and marketing incentives.

The kit includes Linux versions of IBM's DB2 database, Websphere application server, Lotus Domino and Visualage for Java.

Caldera will offer the kit with versions of its Openlinux operating system during a 120-day pilot programme. 'Our research shows a tremendous market need for Linux applications,' said Dick Sullivan, vice-president of integrated solutions marketing for IBM software.

'This programme will help lower development costs and bolster the supply of new e-business applications for Linux. It's a great opportunity for developers, especially those targeting small businesses, to get a foothold in the Linux market.'

Developers of applications for any sized business can register for the free kit through IBM and Caldera websites: www.ibm.com/linux or www.calderasystems.com

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COREL WINS JUSTICE

The US Department of Justice (DoJ), which has spent much of the past five years claiming Microsoft is a monopoly, has ordered a new suite of office software – from a Microsoft rival.

It has signed a multi-million-pound three-year 55,000-user enterprise licence for Corel's Wordperfect Office 2000 suite. The deal includes Dragon Naturally Speaking voice-recognition software and Wordperfect Law Office 2000.

Drivers blockade for peripherals

Linux users are being urged to sign a petition calling on peripherals manufacturers to provide Linux drivers. The fact that the operating system cannot match the hardware support of Windows is seen as a block to its adoption by mainstream users.

The petition, on Linux desktop supplier Libranet's website at www.libranet.com, has amassed nearly 3,500 signatures, but the organisers hope to get two million.

As an alternative, it suggests device manufacturers provide specifications of their products so that Linux developers can write their own drivers. The problems



MP3 player running under Libranet's Linux... the apps are coming, but where are the drivers?

raised go beyond software – one young Norwegian faces jail after helping develop a DVD driver (see p32).

The petition states: 'We believe Linux is not a second-class operating system and that your focus on providing drivers only for the Microsoft operating system is misguided and disregards the

millions of Linux users.'

It points out that the availability of drivers is likely to boost sales. Peter Lemon, an analyst for IDC, said: 'It is an issue for Linux on the desktop, but everything tends to follow volume in the market... Volume is dominated

by Microsoft.'

Minolta has announced it has been working with Linux distributor SuSE on driver support. A spokesperson said: 'Linux users can now enjoy high-quality output from the Minolta Pagepro 8, 18 and 25 printers.'

ADDITIONAL REPORTING
LISA KELLY VNUNET.COM

MOBILES

Dixons' dominance holds up prices

The head of Handspring, a company that produces low-cost PalmPilot-compatible PDAs, has warned that Dixons' dominance of Britain's electronics market may make it difficult for the company to transfer its US pricing model to the UK.

Donna Dubinsky, ex-head of Palm Computing and now CEO of Handspring, speaking exclusively to *PCW* while on a recent visit to London, said: 'I'd love to match the prices we offer the product at in the US, but UK distribution happens to be centralised and one major player has more control over the margins than in the US – Dixons. Because it dominates the market, it can command higher margins, which just translates as higher prices to the customer.'

'It's not the manufacturer that's demanding that. The manufacturer makes no more profit on the product. I bet we can do it on the continent, I'm just not sure whether we can do it in the UK.'

Dubinsky also said that she'd like to push down the cost of the company's entry-

level models even further. 'We would love to get to a \$99 price point in the US, but we can't do that yet. I'd certainly like to think that we can do it in the future.'

Handspring's Palm OS-based PDA product range will be released in the UK some time between April and June this year, Dubinsky said. However, the UK range is unlikely to include the low-cost Visor Solo that sells for just £93 from Handspring's US website.

'In the US the Visor Solo is only sold over the web. We can't bring it to the public for \$149 and have it in the retail channel because we can't afford the retail margin.'

Dubinsky was surprisingly supportive of the idea of a mobile version of Linux for handhelds (see *Crusoe* report, pages 21, 38 and 39).

'If the Linux community did do something for handhelds I would be thrilled, because if I had the option to move to a Linux, open-source environment and not have to pay Palm a royalty, that would be fabulous news,' she said.

'Of all the possible



Handspring's Dubinsky would welcome a Linux PDA

environments out there, that's the one I'm rooting for the most,' she said. 'Unfortunately, today it really isn't a good solution, but I hope it does become one.'

Dubinsky said that the company does not care what OS it uses as long as it can deliver the functionality needed to build a quality product. She equated it to the mobile phone market, where users are not concerned with what embedded OS the phone is built around, they

just care that it does the job. 'If Linux can give me the value I need without having to pay a royalty, great!' she said.

Handspring is set to face hefty competition from the likes of Nokia and Sony, which have recently licensed the Palm OS, but Dubinsky said she is confident that the company can produce more than a mere PalmPilot clone. She argued that the Springboard slot on the back of the Visor product was a key differentiator, as it allows hardware manufacturers to build add-on devices such as MP3 players and digital cameras.

'I think there is going to be a multitude of devices that are, broadly speaking, handheld computers. In the end, the market is going to be far less cohesive than the PC market. The PC market settled into a standard and there's not a lot to differentiate one machine from another. That is just not going to be the case with handhelds. There is going to be a wide range of devices that focus on very different functionalities,' she said.

NIALL MAGENNIS

Return of the Apple PDA

short stories

PHOTO: MOSHE BRANKHA - COURTESY OF APPLE COMPUTERS

Apple is to launch a handheld using the Palm operating system this autumn – just two years after killing off its Newton handheld, which anticipated the PalmPilot by years.

Ending the Newton project was one of the first acts of Apple co-founder Steve Jobs, when he rejoined the company and was given the task of reviving its fortunes. It had been the pet project of former Apple chief John Scully – the first person to use the term personal digital assistant (PDA).

The first Newton shipped in 1993 a good two years before the Pilot – and, many believe, before the technology was ready. Certainly the brand never recovered from the fact that the handwriting recognition on the much-hyped early models was not up to the task.



Jobs killed off Apple's Newton handheld back in 1998

The PDA market took off with the success of the PalmPilot. Microsoft may be able to claw back some market share with its new Pocket PC specification and streamlined version of CE, but the PalmPilot is king of the PDA hill.

The Pilot was originally

targeted at PC users, but last summer a native Mac version was released giving Apple users a clean connection of their own. Pilots are now selling well among Mac users.

Jobs hinted in his keynote speech at MacWorld in January that Apple might launch a PDA. Now sources close to Apple say the company is licensing the Palm OS and is working with 3Com-owned Palm to create business and consumer versions of a Pilot-like device.

But a question remains over Jobs' commitment to PDAs. Rumour has it that Jobs and his team agreed to an Apple Palm reluctantly, after the Palm Computing booth at the two successive MacWorld shows was mobbed by users wanting to buy Mac-to-Pilot software.

TIM BAJARIN; ADDITIONAL REPORTING CLIVE AKASS

PC SALES LAG IN Q3

PC sales to European businesses fell in the final three months of last year, though home users bought more, according to analyst IDC.

PC shipments in Europe, the Middle East and Africa rose by 14.7 per cent overall, to more than 11 million units over the quarter. However, the rate of growth dropped 1.1 per cent compared to the same period last year. But sales in Western Europe showed a 'healthy' 17 per cent growth for the year.

IDC said the pressure to cut prices is hitting profits, forcing vendors to improve their business models.

Compaq remained market leader throughout Europe and regained its number one position in the UK, which it lost to Dell in the previous quarter. Dell recorded an overall sustained growth, but the Fujitsu/Siemens merger pushed it into third spot in Europe.

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TRIO COOKS UP CHIPS

Three major chip makers are forming a partnership called Worldlogic to develop manufacturing plants which can make 0.1micron and 0.13micron processors. Current state-of-the-art plants go down to 0.18micron.

The partners are IBM, Germany's Infineon and Taiwan's United Micro-electronics (UMC). All will contribute engineers to the project at IBM's US-based Semiconductor Research and Development Centre.

Jim Kupek, president of UMC USA, said 0.13micron technology should be ready late this year and 0.1micron by 2002. Worldlogic will also look at ways of embedding logic, mixed-signal circuitry and DRAM on a single chip.



Savings boost for mobiles

New software can save up to 90 per cent on connect time for data calls on mobile phones, its developers claim. DN Mobile drops a connection when data is not being transmitted and reconnects when more is in the pipeline – taking into account the minimum charge of the host carrier. The process is transparent to both the application sending the data and the destination system and it is designed to cope with natural communications breaks. The system, from London-based Brown's, needs compliant hardware at the head end. www.browns.co.uk

Symbian and Palm misunderstood

Fears about deals between Symbian partners and Palm Computing stem from misunderstandings about the company's background, Psion chief executive David Levin says.

Symbian was formed by

Psion, Ericsson, Matsushita, Motorola and Nokia to develop Psion's Epc32 operating system for new mobile platforms.

Motorola and Nokia have both also licensed the user interface of Psion's arch-rival Palm Computing.

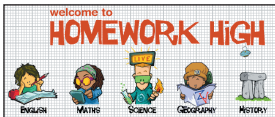
Levin pointed out that Psion itself has development agreements with Palm. He told BBC Online that the aim of Symbian was to develop software for 'communicators, phone pads and mobile phones, and its remit did not extend to the user interface.

net shorts

HOMEWORK HELPER

Channel 4 has launched a free service to help pupils aged between nine and 16 with their homework. Teachers will be available for consultation after school from Monday to Thursday and any questions posted at www.homeworkhigh.com will be answered within 24 hours.

The company plans to spend up to £15m on relaunching its site at www.channel4.com. It



launched a gay and lesbian site in February and plans five new sites for the coming year.

A QUARTER ON THE WEB

One in four Western Europeans used the Internet and one in twenty made online purchases in the last three months of 1999, says analyst IDC.

More than half of all European online sales are German or British, it says. Stefan Elmer, IDC Internet analyst, commented: 'Although many people are buying on an experimental basis... they represent a substantial customer base.'

IDC predicts that Europe's online market will match that of the US by 2003.

VNUNET.COM



DOCTOR WEB

Free medical information and advice is available at a new site. Point your browser at www.netdoctor.co.uk for details.

DVD

Hollywood hits the DeCSS

Hollywood moves to block web distribution of a decryption utility raises questions about the point and effectiveness of DVD video encryption.

DeCSS, which decrypts DVD's Content Scrambling System (CSS), was written last year as part of a project to develop a DVD driver for Linux. A Windows version is now available.

Sixteen-year-old Jan Johansen, who allegedly helped code DeCSS, faces jail after being arrested by Norwegian police and charged with infringing copyright.

Anti-piracy issues were a

Trick question: what does DVD stand for? Digital Video Disc? Digital Versatile Disc? It has actually meant both in the past. Now it means nothing at all. And that's official. John Barker,

chairman of the DVD Summit III, to be held in Dublin in April, said: 'DVD is now just DVD in deference to the worldwide scope of this internationally recognised standard.'

major brake on the rollout of DVD because digital recording, unlike analog tape, maintains the quality of the original.

DVD-R disks, the only ones that currently work in all DVD players, store 4.7GB a side and require a very expensive write drive. But commercial DVD videos are laid down in two layers at the manufacturers, a process no drive can yet do.

Cheaper DVD-RAM drives, set to ship later this year, will store 4.7GB a side but are not readable by all players; low-cost 4.7GB DVD+RW drives using disks which are compatible with DVD players are not now expected until next year. But even if DVD-write capacities rise and media prices fall, DeCSS is not going to help pirates because there is nothing to

stop them copying a video, encryption and all. DVD players bundle decryption.

DeCSS has been called the MP3 of movies, but it will be a long time before bandwidths allow massive DVD files to be swapped as easily as audio files over the web.

It is hard to see how DeCSS distribution can be prevented, although it has been removed from some US sites following court action by the Hollywood lawyers. It is also hard to see why lawyers picked on Johansen and DeCSS. Decryption utilities have been around for some time.

British coder David Fawcus, who was involved in the Linux DVD driver project, said: 'CSS is more about control of the player market, as it does not prevent the copying of DVDs.'



French video specialist Com One is selling web-based surveillance kits that allow you to view premises remotely. Up to eight cameras can be controlled via a single VM4 IP modem. Pictures can either be triggered by an alarm or sent by remote request. www.com1.fr

MP3s back in the dock

A new instant listening service at a leading MP3 website has sparked court action by the Recording Industry Association of America (RIAA).

MP3.com lets you download tracks from any

CD you have bought from its site or partner sites so you can listen to the music while the disc is on its way – giving online purchasers the instant gratification of a shop.

But RIAA claims the system, called My.MP3.Com

breaches copyright. RIAA chief Hilary Rosen said in a letter to MP3.com: 'It is not legal to compile a vast database of our members' sound recordings with no permission and no licence.'

JAN HOWELLS, VNUNET.COM

SECURITY

Fears surround a tool that spots randomness to pick out encrypted keys.

Hackers pose key threat

Hackers could steal highly sensitive encryption keys from ecommerce sites using a new tool developed by UK security specialist nCipher, the company claims.

Intruders would need only to load files to the server hosting the site – not unusual, as many service providers have web space for several companies on one machine.

Servers using Apache, Netscape or Microsoft software are all vulnerable to the attack, says nCipher chief executive Alex van Someren.

The tool isolates where the data is most random, which

is where the key is generally hidden, but it could also be used to capture credit card information, he said, and added that 'No security clearance is required'.

Alex's brother Nicko likened the task of finding a key of a few hundred bytes on a multi-gigabyte server to finding a needle in a haystack. He and Israeli Adi Shamir (the 'S' in the RSA encryption system) presented a white paper early last year showing the theory behind the attack.

The tool converts data bits into pixel patterns and analyses their randomness, or entropy. nCipher recommends that

keys should be stored on a dedicated piece of hardware, separate from the server: it currently sells such a device. Microsoft and Netscape are both adding support for hardware-based key storage to their products. IIS 5 will support hardware key storage, while a patch is available for IIS 4 and Enterprise Server 3.5.

Jim Hurley, analyst at the Aberdeen Group, said: 'The threat of possible key-finding attacks illustrates a significant vulnerability to today's Internet economy.'

ANDREW CRAIG VNUNET.COM
WWW.NCIPHER.CO.UK

Biztalk delayed for extra features

Microsoft's Biztalk Server ecommerce software has been further delayed to allow more functions to be added.

A beta of the XML-based product, due to debut last summer did not reach testers until December.

The new features will take it 'far ahead' of rivals such as Hewlett-Packard's eSpeak.

Richard Godfrey, Biztalk Server software engineer, said: 'It was a choice between bringing a product out the same or a little better than the competition, or putting something in to make it better.'

The first beta was set to be available in March.

JO TICEHURST VNUNET.COM

Agency gets a cyber face-lift

Press Association, the news agency financed by Britain's own media industry, used to produce formula-written copy for its clients to rewrite. But times have changed.

PA has its eye on feeding the web's insatiable appetite for content, and it is picking

up a style of its own. Not only has it set up a slick news site at www.pa.press.net, but it's training up this green-haired cyberchick to present it.

Ananova will use sophisticated text-to-speech technology to read the news and other items. And she will



front information services due out next year targeted at

appliances such as mobile phones.

NEXT-GENERATION TECHNOLOGY

Clive Akass takes a first look at Transmeta's long-awaited low-power, configurable chips.

Crusoe chips will keep you mobile

Industry reaction to Transmeta's new Crusoe TM3120 and TM5400 chips (see page 21 and opposite) has been muted, considering the excitement that preceded January's launch.

The secrecy surrounding their development, and the involvement of Linux guru Linus Torvalds, were enough in themselves to generate interest; but it turns out that the chips *do* justify the excitement, if only because they are so different. Paradoxically, this also accounts for the cautious reaction: nobody knows how they will work in practice.

Their main selling point is low power consumption, promising as much as eight hours or roughly a full day's work from a notebook battery. As interesting, although perhaps of less commercial importance, is the fact that the Crusoes are code chameleons – they can be tailored to any instruction set and can therefore, in theory, run any software.

The basic Crusoe architecture (see diagram) is not that different from any x86 clone. BIOS, operating system and application code are fed through threshold logic which translates it into instructions that can be executed by the processor core. The major differences are as follows.

• Code-morphing engine

This is Transmeta's name for its translation logic and it sits outside the chip on ROM and is loaded into RAM for fast execution on boot-up. Most chips, including standard Intels, use some form of translation engine,

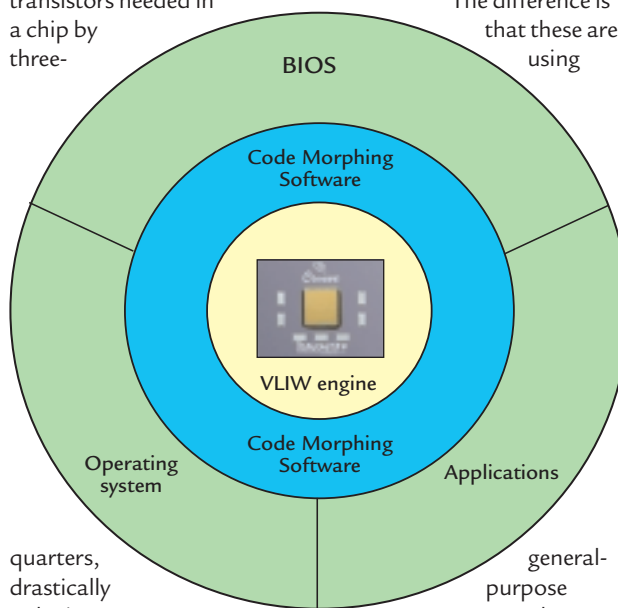
but it is hardwired in for extra speed.

• The VLIW core

Transmeta's use of Very Long Instruction Word architecture (see opposite) runs counter to the trend of recent years, which has veered from Complex Instruction Set Computer (CISC) to Reduced Instruction Set (RISC) to a mixture of the two.

The net result is to cut down the number of transistors needed in a chip by three-

quarters, drastically reducing power consumption. The TM5400 can cut power drain further by switching clock speeds and operating voltages on-the-fly to give only the performance required by the task in hand (see opposite). The soft code-morpher has the added benefit that, unlike hardwired logic, it can be upgraded to include bug fixes and extensions to an instruction set. An early TM5400 upgrade is likely to provide support for Intel's SIMD and AMD's 3Dnow extensions, which is missing in the launch version.



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The morpher also provides

The difference is that these are using

general-purpose processors that reprocess code internally before execution, whereas Crusoe chips have been optimised for specific translations and process them directly. This is why the TM3120, designed to run Linux, has a different core from the TM5400. The downside is that a Crusoe will run one instruction set more efficiently than others.

Crusoe chips optimised for other tasks are planned. Inevitably, as no code is being run native, there is a performance hit: one estimate was that a 667MHz TM5400 would be roughly

equivalent to a 500MHz PIII. But with most mobile applications, this still leaves a lot of computing power to spare. In effect, processing power is being used to save electrical power – a case of Mips conserving Watts.

Torvalds, surprisingly, did not work on the special mobile version of Linux used by the TM3120. He was one of the team developing the code-morphing software, which, according to Transmeta, is where some of the cleverest work has been done. It fragments the code, several instructions at a time, into operations that can be fed efficiently into the VLIW core.

Translations are cached in RAM so they do not need to be repeated. Initially, the caching policy is based on the spread of instructions in real-life applications, but the software monitors hit rates to optimise caching for a particular application. In other words, it learns how to run an application better.

This raises problems when trying to assess performance, because it will improve over time. Benchmark tests that run through tasks in many different applications will give misleading results; so will any that run an application only once.

It is still unclear whether the Crusoes will find a market if nothing else they highlight the fact that faster processing speeds can bring more than just flashier graphics. They could alter the relationship between hardware and software, and herald a new class of exotically configurable processors.

A white paper is at www.transmeta.com.

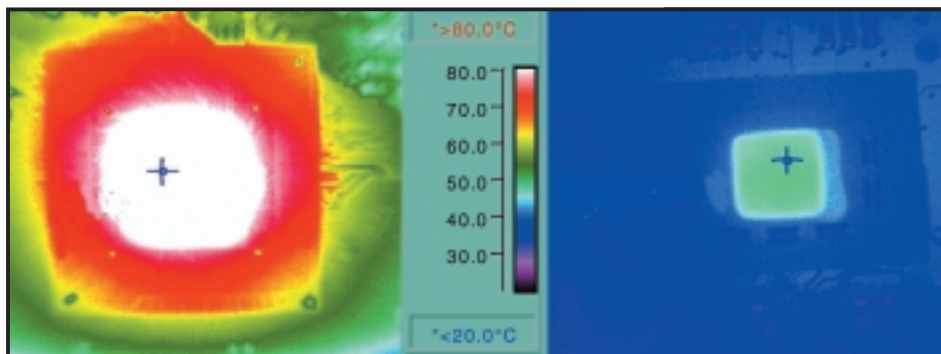
Cool chips are hot stuff

You can see the marketing pitch a mile off: Crusoe chips are *cool*. Their low transistor count means they draw less power and thus generate less heat. This saves still more power as they don't need fans, which also makes them quieter. Cool chips simplify design because you can dispense with bulky heat sinks and tricky ventilation.

The TM5400 uses a technology called LongRun, similar to Intel's SpeedStep (aka Geyserville) and AMD's Gemini. All reduce power drain by dropping the voltage and clock rate, but the TM5400 does this incrementally and on-the-fly.

SpeedStep switches a notebook automatically between two power states, depending on whether it is running off a battery or mains. Crusoe's code-morphing engine works out current processing needs and switches voltage and clock rates accordingly in 0.05V and 33MHz increments.

Power varies linearly with the clock rate and by the square of the voltage, so these changes can produce cubic reductions in battery drain.



Transmeta claims the TM5400 consumes as little as 10mW running a low-demand application such as email, and up to 2W running a demanding DVD movie – and that is with PCI and memory controllers integrated. Intel says its new SpeedStep-enabled 600MHz PIII uses

around 8.5W in low-power mode and 13W on high.

Transmeta cites a typical 32W-hour notebook battery and a 4W average drain from other components, figures which translate into a battery life of between 5.3 and eight hours for a Crusoe device, or 2.6 hours with the PIII.

This Transmeta picture shows temperatures around an uncooled PIII (left) and a Crusoe TM5400.

Transmeta says a TM5400 (see diagram opposite) runs at 48°Celsius, whereas an uncooled PIII can hit 105°Celsius.

Transmeta's molecular approach

Very Long Instruction Word (VLIW) coding is notoriously difficult and, as its name implies, takes its instructions in chunks.

A Crusoe word can be 64 or 128bits long and contain up to four RISC-like instructions. Transmeta refers to Crusoe's words and sub-instructions

as 'molecules and atoms'.

These are fed into a relatively simple VLIW engine consisting of a floating-point unit, two integer units, a memory load/store unit, and a branch unit.

Each atom in a molecule has to go to a different functional unit, so that an

entire word can be processed at the same time. Processing is thus implicitly parallel.

The morph engine's job is to pack words so that this is done as efficiently as possible. Instructions are dealt with in strict running order – avoiding the out-of-order circuitry of standard x86 processors.

INDUSTRY

Microsoft must choose its next steps carefully to avoid becoming a victim of its own success.

Microsoft at the crossroads

Predictions of the death of Microsoft* may be premature but, even discounting the long-running, anti-trust case against the company, it is going through some odd times. There are parallels with the late Eighties when IBM saw its mainframe-based hegemony crumble, an event culminating in the posting of a £1.75bn loss in 1991.

The agent of that change was the networked PC, which put near-mainframe power plus a friendly graphical interface onto the desktop. The problems facing Microsoft are more various but they include the fact that, in public perception at least, the company retains the role of IT superpower that it snatched from IBM.

The result is a lot of bad feeling against Microsoft (as there had been against IBM); some of it is justified by past misdeeds and some is simply a reaction against success. The relative failure of Windows CE was partly due to the quality of the code, but it also owed a lot to a gut reaction from vendors and users against allowing Microsoft into a new market. Anti-Microsoft



New outlook on the Microsoft campus at Redmond, Washington

feelings also help energise the Linux movement.

The Internet is the major cause of the ground shifting under Microsoft. Linux and other open-source software grew up on it and its hardware-independent, open standards have encouraged the development and use of computers devoid of Microsoft software. We have seen only the beginning of these developments, but it is enough to shatter the mindset that computing equals PCs and Microsoft.

The mega-merger of service provider AOL and Time-Warner, with EMI joining as a postscript, shows

also that Internet profits will derive at least as much from content as from hardware and software. Microsoft may have won the browser war but its MSN is an also-ran in this market.

That Gates can lose his golden touch in unfamiliar areas is not surprising, but he is struggling to keep revenue growing on home territory. Sales of PCs, and of the Microsoft software bundled with them, continue to rise; but Windows prices look vulnerable as rival operating systems gain credibility and hardware costs plummet. Also, income from upgrades will tail off as there are only so many that Microsoft can offer, especially with users complaining of feature bloat.

Which is why Microsoft is so keen on transforming itself from a software developer to a seller of software services, providing long-term revenues. To this end, versions of Office and Exchange are available for hire from Application Service Providers (ASPs). (Lotus, beset by some similar problems, is also trying to open new service-based revenue streams – see p53).

This shift of emphasis is said to be why Gates handed

the running of Microsoft to his friend Steve Ballmer, a marketing man who is thought better able to ring the changes. Gates will remain allegedly to steer software development.

All of which makes the timing of the Department of Justice's anti-trust suit ironic, if not irrelevant. It comes when Microsoft's de facto monopoly is slipping away, and the company is having to adjust to the fact that the world no longer relies completely on Windows.

This shift is not necessarily bad for Microsoft, although its market value and revenues may be hit in the medium term. A near-monopoly held too long can become a liability: it makes you less flexible. And once you lose your status as the industry's sole perceived superpower, you cease to get blamed for everything that goes wrong. You may even retain power, but it will no longer be seen as deriving from an unfair edge.

Just look at IBM, a decade after the business world ceased to rely so heavily on its mainframes; it is richer and perhaps as powerful as ever, with revenues regularly more than twice those of Microsoft. But it is Microsoft, not IBM, that gets cursed from desktops all over the world each time a PC (what used to be called an 'IBM compatible') throws a wobbly.

Microsoft could yet be broken up as a settlement of the anti-trust suit, although Ballmer and Gates both say they will fight to keep it intact. Multi-billionaires both, perhaps the biggest question is why either of them bother.

* See Eric Raymond interview on p120



Frame up... IBM's five-ton 1944 Automatic Sequence Controlled Calculator, or Mark I, developed in co-operation with Harvard University, helped give the company an early lead in the mainframed post-war world

FUTURES

Tim Bjarin charts the future of a market that **continues to grow**, despite fears to the contrary.

PC sales defy the voices of doom

Doomsayers who predicted a slowdown in both PC sales and Internet commerce have been confounded. PC sales grew at a solid 23 per cent worldwide last year, while eight per cent of the 50 million people in the US who have access to the web bought products online at Christmas, up from two per cent the year before.

Internet stocks, far from crashing, ended the year on a high note. Old timers like Amazon and Yahoo achieved market valuations in the billions, though neither has shown any significant profits. More than 450 new Internet firms went to market for the first time and some, such as Red Hat, Freemarket and Akamai rose to blistering heights.

Talk of a 'post-PC' era soon gave way to that of a 'PC plus' era, as the predicted explosion of new Internet appliances failed.

But we have turned a very important corner and 2000 will be seen as a time when the IT groundwork for the next 10 years was laid. This embraces three technologies:

■ Broadband

In the US, cable modems and the various forms of Digital Subscriber Line (DSL) are being deployed. By the end of 2000, at least 65 per cent of the US will have web links of between 128Kbits/sec and 1.5Mbits/sec, allowing sites to offer much richer content.

■ Client-server apps

Applications will shift to the Internet. Leading the charge will be Microsoft, with its Office suite being deployed completely online by mid-year. Firms like Intuit, Lotus,



Fast fibre, such as this from an Alcatel plant, is reaching more and more homes

Corel and others are making online apps a high priority.

■ Processor speeds

Intel, AMD and Motorola will all have chips that process data at 1GHz by autumn. This won't impact traditional applications, but will enable the deployment of a new generation of facilities like voice recognition, voice navigation, 3D imaging and video, which will change the nature of user interfaces.

Vendors will be able to take advantage of this processing power by sending – over relatively slow links – highly-compressed data streams. The PC can then unpack these to enable real-time video, animation and 3D.

At the same time, we will see an even greater demand for MP3 players, handhelds and larger portables, digital cameras and WAP phones, while Sony's PlayStation 2 should revive the games market. We don't expect web appliances to take off until 2001 and beyond.

All of these things should cause continued growth in the technology sector. The

one important speed bump will be a consolidation within the Internet sector. More and more people will be surfing and shopping online – but not enough to support the current plethora of sites chasing the same customers. Some time soon we expect a serious shakeout.

Key backbone providers – such as Cisco, Intel, Nortel and 3Com – should not be impacted much. But sites that came in late and provide a

third, fourth or even fifth option within a category will go broke, or will be bought up by some of the bigger players. Yahoo, AOL and MSN are the clear leaders among the portals but others, like Lycos and Infoseek, could end up losing to the big guys.

One sector that should

weather this storm for the time being is ecommerce sites going after the business-to-business market. This is a relatively new category within Internet offerings and while many will pop up in 2000, we don't expect a shakeout in this area until 2001.

Most things point to a very robust year in the world of technology. By this time next year, we should see PC growth continue at around 23 per cent worldwide.

Mobile spy in the sky

Cellular specialist Qualcomm has scored a coup with its acquisition of SnapTrack, which has developed a chip that can locate cellphone callers to within 50ft.

The deal came prior to a Federal Communications Commission order requiring wireless-phone companies to be able to locate the origin of emergency calls in the US by October 2001.

The FCC ruling has been

controversial, however, because some say it is an invasion of privacy. FCC says the idea is to save lives – but it could also be used to track drug dealers and other criminals who commonly use cellphones.

All cellphones will have to carry the chip, which uses GPS, by the 2001 date. The 65 staff at Qualcomm are each likely to be millionaires when the deal closes later this year.

Clive Akass reports from

Lotus blossoms using its IBM links

There is no telling who is going to make a success of a marriage. When Lotus wed IBM in 1995 it looked like a case of a woman past her prime settling for a rich and powerful old man. Time had put paid to Lotus' young and trendy image. Its products were being crushed by the Microsoft Office juggernaut, and even the popular cc:Mail was looking dated.

Lotus' flagship Notes, a co-operative working environment based around data stores and messaging, had 2.2 million users, and there was nothing else quite like it. But it was beginning to look like a loser, as the world moved to web protocols. And it retained a snag of the first release back in 1989: Notes was one environment sitting on top of another. The case is still the same today, as Windows uses one file system and Notes uses another – and this can be confusing even for power users.

Yet Notes now has 56 million users, according to Lotus' departing president Jeff Papows. Even allowing for some massaging of statistics, that's a huge figure for a product that has racked up almost no sales outside the corporate market.

One reason for the success is that Lotus managed to adjust to the web. Its Domino server, released in 1996, was designed to open Notes to browsers and matured last year with the much-delayed Release 5.0. Also, the match with IBM turned out to be well-nigh perfect. IBM had more corporate customers than anyone in the world and, having lost the OS market to Microsoft, it needed software

to sell to them. It knew what customers wanted and told Lotus, and sales soared.

You can do everything with Microsoft software that Notes does. But as analyst Clive Longbottom, of Strategy Partners, points out, you have to pull a lot of bits and pieces together. 'With Domino, you get all that functionality straight out of the box. It just works.'

browsers some of the functions of the full-blown Notes R5 client. These features include database replication, allowing data to be synchronised with notebooks.

Coming out in parallel is another feature set called Mobile Notes, that gives WAP phones browser access to Notes data and uses XML to provide further Notes

terms of how well it uses them. Central to this style of management is the idea that the most potent savvy is in people's heads.

Raven is, at its simplest level, a front-end to a variety of information sources that you can set up yourself. It also maps 'affinities' within an organisation, flagging the skills and knowledge of members. And it provides ways in which assets can be marshalled and used; these include a virtual meeting place called Quickplace (see also p24).

Critics say KM is no more than a set of old ideas wrapped up in new jargon to sell more software. But it got a lot of positive reaction at Lotusphere.

Raven raises some thorny issues, as Lotus is first to admit. A head of department who knows how to fix the copier is not going to relish a flood of Raven-inspired support calls. So people have to be given the choice of having their skills itemised or called upon. There is also the question of whether a company owns all an employee's skills: should someone hired as a singer also be expected to dance?

And Ovum analyst Eric Woods points out that Raven could cause havoc by 'opening up a new metric which shows where the real expertise lies' – and this may not correspond to an organisation's existing heirarchy.

But Scott Smith, managing principal within IBM Global Services, said: 'Think of the cultural change if you really start to reward people on the basis of their expertise.'



Mobile Notes, which allows PalmPilots to access Notes data, will be released later this year. Support for other devices will follow

It has to be said that the Notes environment does not always work better: Microsoft knows a thing or two about usability, for a start.

But like everyone else in the business, Lotus sees a horizon beyond Windows. It has wedded Domino to IBM's WebSphere for transaction processing to create an ecommerce system. This year it will roll out a set of plug-ins called iNotes, which give

functionality to handhelds – the first supported being the market-leading PalmPilot.

Lotus began last year to tout a couple of new buzzwords – Knowledge Management (inevitably shortened to KM), which it has finally unveiled as a technology codenamed Raven. KM sees the assets of an organisation in terms of the total of its knowledge and skills, and its efficiency in

Lotusphere in Orlando, Florida

Outlook given the keys to Notes

Lotus is to allow Outlook freer access to Notes data, as part of a new policy of working with Microsoft products. And it is to stop supporting its own cc:Mail email client – despite the fact that it gained 160,000 users in the last three months of 1999.

Outlook provides email, calendaring and contact-management facilities within Microsoft Office, duplicating some of the functions of Notes. Poor integration has been a constant irritation for people who use both Notes and Office. You cannot, as standard, use Outlook to read Notes mail.

Neither, without using a third-party product, can you do something so apparently simple as saving a Word file straight into a Notes document store. In reality, this process is not that simple, as a Word file has a

single address – whereas a Notes file may appear in several relevant folders. Still, Lotus executives say this feature ‘should be available’ this year.

The Outlook link is expected within a similar timeframe, though some functionality – such as room booking – will be lost when using Notes data. Analyst Clive Longbottom, of Strategy Partners, thinks this is a big mistake: ‘The problem is that the bits you can’t do will be the bits people want, and they will blame Lotus rather than Microsoft, even though it may not be Lotus’ fault. Lotus would have done better to provide a Notes client for Office, that included all of Outlook’s functions and more.’

Lotus does plan to ship a product later this year that will allow users of Exchange, Microsoft’s messaging server,

to access the collaborative features of Notes.

Longbottom also thinks Lotus is wrong to turn its back on cc:Mail, which still has 11 million users. While Ian White, a senior consultant at Lotus reseller Lloyd McKenzie, said the company was getting ‘money for old rope’ from cc:Mail.

But Lotus’ apparent strategy is to convince existing cc:Mail users to upgrade to Notes. In the meantime, telephone support for cc:Mail will continue this year, but president Jeff Papows said: ‘There is no commitment beyond that.’

ADDITIONAL REPORTING BY
ANDREW CRAIG, VNUNET.COM

Pay-as-you-go is on the cards

The connected world is producing byzantine new pricing structures. Users of the new Outlook link will have to pay a client access licence (CAL) to Lotus for accessing its Domino server.

Other CALs are due, in theory, from anyone who uses a browser to access Notes, though Lotus admits privately that there is no

foolproof way to police the payments.

Users of Mobile Notes platforms, like the Palm V, will have to buy a CAL but this will include Lotus client software.

Lotus proposes to take a fee for each access of Notes-based WAP services. It will be paid by the service provider, and so this will be transparent to the user.

Papows bows out but denies he was pushed

Lotusphere was a particularly trying experience for departing president Jeff Papows, who had been hit by a series of scandals.

He was sued by a female colleague, who claimed workplace bias that stemmed from a long-standing ‘intimate relationship’ between Papows and his secretary.

Only weeks previously *The Wall Street Journal* had accused him of garnishing the truth about his life. The paper said he had claimed variously to be an orphan, a Marine Corps captain who saved a friend’s life by throwing a grenade to safety, and an F4 pilot who once had to eject to



Zollar (left) replaces Papows as president of Lotus, although the latter denies that stories about his private life forced him to leave

escape a crash that killed his co-pilot.

In fact, said the paper, his parents were alive and well, he was a lieutenant, and the nearest he had ever been to



any military drama, flying or otherwise, was a job in air-traffic control.

He resigned on 6 January saying that he plans to run his own company. ‘This has

certainly been a period of a ridiculous degree of attention to everything from my relationship with my parents to the veracity of my hobbies [sic],’ he told a Lotusphere press conference. ‘But I tell you point blank that this had absolutely nothing to do with my decision to leave.’

He is succeeded as president by Al Zollar, an IBM man. John Thompson, head of IBM Software, stressed that this did not herald a tighter IBM rein. ‘I think what is important here is that Lotus and its people and customers take advantage of the synergy with IBM without becoming smothered by it,’ he said.

Cambridge, aka Gamesville

Many games branded under big US and Japanese names were developed around Cambridge. Sony has a games team working south of the city, and just to the north is Frontier Developments whose founder, David Braben, has been producing games and development tools since he co-authored its most famous product, *Elite*, in the 1980s.

Now the six-year-old company employs 16 people working on three multi-platform games, including the version 4.0 of *Elite* and development tools for Windows, PlayStation, PlayStation 2, Dreamcast and other platforms. A typical game project takes 18 months to two years and can cost more than £1m – a lot to a company that turns over less than £10m year. But it has always made a profit.

UK developers create nearly 30 per cent of all games published across the globe, with sales of around £1bn this year, which makes them bigger than Britain's film industry. So the perception that the hugely profitable games industry is



Frontier's V2000 game proves it's a jungle out there in Cambridge

overshadowing the film business is perhaps the case, says Braben. 'It has got Hollywood worried and rattled... games are cheaper to develop than films.'

However, a lot of US investors have had their fingers burned putting money into new, inexperienced games companies. 'The mature view is to back people with track records,' Braben said.

Games developers too are having to face changes as the mobile phone becomes the Walkman, Game Boy and web browser rolled into one.

And the migration of games from the PC to the TV, helped by devices such as the PlayStation 2, could open a new market among the kind of people who have always regarded computer games as 'horrible bleepy things'.

Cyberlife, just down the road, has rebranded itself as Creature Labs and is focusing its artificial-life technologies and Creatures products for the entertainment markets.

New projects include a

large-scale virtual world – a Creatures docking station, due to ship later this year, which will let users around the globe talk to each other and exchange Creatures and objects without needing to exit their virtual world.

Product development director Ian Saunter said an artificial-life approach can produce more interesting behaviour from characters in games. 'We can borrow ideas from mother nature to create and simulate behaviours using biological metaphors.'

Creature Labs is investing heavily in multi-player, online gaming, which it believes will become increasingly popular.

Saunter points out that one in four UK homes has a PlayStation. 'Gaming is a huge part of the public consciousness. We are going to see a convergence with other entertainments and a demand by users for more lifelike responses from computer-hosted agents.'

www.frontier.co.uk
www.creaturelabs.com

Caroline Swift



reports from Silicon Fen

Gordon Laing is fed up with **Bluetooth promises** when there's already a wireless standard out there.

Bluetooth-ache



Everyone talks about getting connected, but it's not much good if you haven't got the right plugs or don't know where to stick them. Countless hours tearing out what little hair I have left is why I'm currently very excited about Bluetooth,

which, with any luck, will get all manner of devices talking to each other without a cable or connector in sight.

It was a couple of years ago that the rather impressive quintet of Toshiba, IBM, Intel, Nokia and Ericsson got together to hammer out a short-range wireless communications standard. The system would let two or more suitably equipped devices wirelessly connect at distances up to 10m, and at speeds approaching 1Mbit/sec. Proud of their unification of IT and telecoms companies, the standard was appropriately named after the Viking king Harald Blåtand, who achieved peace in Denmark and unified Scandinavia.

Bluetooth was born, and all was happiness and light

Bluetooth may also boast 1Mbit/sec at launch, but INFRARED SPEEDS ALONG at 4Mbits/sec on almost every notebook

– well apart from the fact there are still no devices for sale. Every year at trade shows we're told stories of how great Bluetooth will be, and that products will arrive in, ooh, let's see, about six months' time. Trouble is, I've been assured about this six-month window for about two years now. In fact, only the other day I was told that Bluetooth products would arrive some time this summer.

This endless waiting game, while not uncommon in the IT industry, has got me slightly nervous. I'm convinced that Bluetooth could revolutionise the way our portables communicate with each other, our networks and desktop peripherals, but fear that, if we're not careful, we could have a replay of infrared.

Yes, while we 'ooh' and 'aah' at undeniably groovy concept-Bluetooth applications, let us not forget that we already have a perfectly good, but tragically neglected wireless standard. Okay, infrared only works between two devices at a time and demands that they be pointing at each other, but is that so bad? Security-wise it's a

benefit as, after all, line of sight virtually eliminates the possibility of eavesdropping. Bluetooth may also boast 1Mbit/sec at launch, but infrared speeds along at 4Mbits/sec on almost every notebook. If that's not good enough, then 16Mbit IR is already here, and developers speak of 100Mbit over longer distances using lasers.

So if infrared is so good, then why don't we see it fitted to devices as standard? OK, most notebooks and PDAs are suitably equipped, as are many high-end mobile phones, but what about PCs, printers and network hubs? Each and every Bluetooth preview talks of strolling into a room with your portable and instantly connecting to a network, or being able to fire off pages on a printer. Sounds great, but this could already be done with infrared if manufacturers bothered to fit it to their PCs and peripherals. Apart from HP's brief flirtation with a handful of LaserJet printers, no-one has fitted infrared onto any desktop mains-powered device I know of.

Ah, but the Bluetooth posse cite wide industry support as confirmation of eventual success. Indeed, the original founders have since been joined by 1,200 others, including the recent arrivals of heavyweights Lucent, 3Com, Motorola and (at last) Microsoft, but I'd argue that this is far from a stamp of surefire success. Infrared already has backing from most of these big companies, but only finds itself fitted on a very limited range of devices; why will Bluetooth be any different?

To be fair, Ericsson has already shown a hands-free wireless Bluetooth headset and clip-on module to equip some of its mobile phones, but where are the other devices? While we're at it, I've not heard much about the high-level user experience either. The next time you hear someone describing how Bluetooth lets a group of notebook users instantly create a secure, wireless network, ask them exactly how this would work in practice. Will a collection of Bluetooth laptops really start talking to each other and automatically configure themselves into a wireless LAN the instant they're placed within a 10m radius? I'd like to believe it could be that easy...

I love technology predictions as much as the next person, but as release dates continue to be pushed back, I want to stop hearing about blue-sky predictions and start seeing some hard evidence. That and some guarantee that they'll appear on more than just mobile phones and portables. I'm sure Harald Blåtand would agree.

gordonl@pcw.co.uk

Barry Fox has had enough of clueless users who email large, zipped files – **complete with virus.**

Foot in mouth disease



It's been called the electronic plague. The disease is spreading because PCs are now sold as a mass market commodity like VCRs, television sets and personal stereos. Getting onto the Internet and sending email has never been easier.

But Internet sign-up discs or the PCs themselves don't come with a health warning on how easy it is for a virus to burrow inside a macro, or animated greetings card, springing to life as soon as the file is opened. The virus can then bury itself in whatever messages the recipient sends out as binary files, before trashing the PC's hard disk. Those who should know better, don't.

PR people employed by high-tech computer firms often send me JPEG images, without asking whether I want them. They zip files to compress them, thereby making it more difficult for anti-virus software to scan them. Even if the software is updated each week (and how many people do this?) new viruses can slip through.

I now have a standard email reply that politely reminds anyone sending a binary that it is the words that count, not the fancy layout and fonting. Word or PowerPoint inflates a few hundred words of safe ASCII text to many hundreds of kilobytes. This really matters when you are downloading by an expensive GSM cellphone link at 9.6Kbits/sec.

I also get sent MIME messages, which some email systems cannot handle. These messages are often headed by a list of other recipients, which infringes privacy and wastes even more space.

It's often not the sender's fault. No-one has told them how to cut and paste, save an attachment in plain text, or use BCC (blind carbon copy) to head each message with only one address. Unfortunately, some are too proud to admit and learn. The knee-jerk defence is that no-one else has ever complained. Anyone at the receiving end of this kind of brush-off may like some reassurance that they are most definitely not alone and the risks are real.

ELSPA, the European Leisure Software Publishers' Association, sent out emails telling how its crime unit had busted a company at ECTS, for selling a cartridge that allows a PlayStation console to play copy discs. It wasn't surprising that this story received so little coverage. ELSPA's publicity people emailed the short press release as an enormous file that included photos, and was then

zipped down to 360KB. The text was in MIME, too. I asked ELSPA for plain ordinary ASCII text, with no pictures. Back came more zipped MIME. So I asked again for ASCII. They finally gave up and faxed me a printout.

Lucent Technologies, formerly Bell Labs, bulk-emailed a press release that contained a macro virus. It was one of the recipients, not Lucent, who spotted it and sent a warning message to all the potential victims. Lucent then sent out an apology – accompanied by another binary file.

Soon after that I got a bloated binary publicising 'The Future On Line' an Interactive Event staged by BAFTA. Even before I had the chance to ask for ASCII, another email arrived: 'IMPORTANT MESSAGE – PLEASE READ', it shouted. 'Please disregard the email sent to you earlier; we understand it contained a macro virus.' And yes, you've guessed it, the second message was also sent as a bloated binary attachment. I asked for ASCII and got nothing, until they too gave up and faxed me a printout. Then, without a flicker of apology, BAFTA's promotions people bulk-emailed a Virus Alert message, admitting that it had 'detected a virus on our system' and advising everyone on its mailing list to install anti-virus software.

This problem is not going to go away. Although new PCs may come with anti-virus software pre-loaded, there is often no advice on how to update the virus signatures.

Internet sign-up discs or the PCs themselves don't come with **A HEALTH WARNING on how easy it is for a virus to burrow inside a macro**

Most upgrades, except from newcomer Panda, cost money after a free taster.

The real irony is that the UK Government's DTI Action 2000 team spent a small fortune of our money scaring the public witless about the largely non-existent Millennium Bug. All that was really needed was one clear reminder for those large companies with old mainframes that they had to fix their systems or go out of business.

The Y2K campaign was a golden opportunity to inform and educate the mass market about the wider implications of working with PCs, the risks of virus infection and the simple rules for avoiding it. But the DTI blew it. Worst of all I doubt they know enough to understand what they blew.

barryf@pcw.co.uk

Although the mobile phone has become ubiquitous, **the PC reigns over the web**, says Brian Clegg.

Upward mobility



It had to come. The yuppie's icon is now an everyday companion. Where once the sight of anyone cradling a mobile phone caused envy and irritation, now it's a common sight that we take for granted.

This mobile explosion – over 40 per cent of the population now use mobile phones – has excited IT strategists. PCs remain an expensive option; as technology develops, mobiles could be the new gateway to the Internet. Mobiles have greater penetration and built-in (potentially lucrative) networking. You can almost hear the virtual cash registers chinking.

It would be unwise to underestimate the mobile phone's potential. You only have to look at a website such as Mobile Explorer (www.mobilexplorer.com), dedicated to the impact of mobile communications on business, to see what is possible. But the pundits are jumping on a bandwagon that is moving slower than they realise. About three years ago, some were predicting doom and gloom for Microsoft and Intel. A respected

Ananova (see www.ananova.com), an animated newsreader developed by the PA News agency. Ananova will deliver the news to your phone's screen, but even she's a retrograde step compared with the rich mix of multimedia and personal selection that the Internet offers today.

Part of the attraction of the web, unlike TV, is that it's a two-way process. It's not practical to deliver this on a phone with a QWERTY keyboard designed for human fingers, so the great hope for making the mobile the information appliance of the future is speech. It makes sense. After all, speech is what phones were designed for. And some of the components are already here. Speech recognition and synthesis have advanced remarkably in the past five years. A new web technology, Voice XML (see www.voicexml.com) is being developed to make it practical to access websites using a speech interface. Fronted, perhaps, by the lovely Ananova. And yet I remain sceptical.

What would happen to the rich experience of dealing with the Internet? Take a brief excursion I made recently. I glanced at 15 emails (deleting some obvious spam without reading them), then popped into the BBC news site (news.bbc.co.uk). There I glanced over the headlines and pictures, following up one story that interested me. Next I switched to BookBrain (www.bookbrain.co.uk), the online bookshop comparison service, and entered a book title. At a glance, I chose the best shop on delivery and price. I then clicked through and made sure it was really the book I wanted (I had guessed the title) by checking the cover and reading part of the blurb. Finally I bought the book.

A phone equivalent would be much clumsier. It would take longer to get through the emails. The news headlines would be equally slow, especially without high-quality pictures. I couldn't take in all the information about the different bookshops without making notes or scrolling back and forth. And it would have been significantly harder to make sure I was buying the right book. I'm not saying that having it on the phone wouldn't be useful, particularly if I was stuck somewhere without access to a screen. However, just as people don't put up with 12in monochrome TVs, despite their cheapness, I'm not convinced that speech will win millions away from the visual experience.

Mobile phones have a long way to go before they can **KNOCK PCs OFF THEIR PERCH, particularly in business**

industry analyst commented that 'their growth and profits – even their viability – will be under severe threat'. The reason? We would all abandon our PCs for network computers. We've seen similar predictions for TV set-top boxes. I'm not holding my breath in the face of these threats, or the challenge from the mobile phone.

The fact is that mobile phones have a long way to go before they can knock PCs off their perch, particularly in business. While many private individuals and small companies consider a mobile phone part of normal life, large companies still consider them tainted with a hedonistic air of unnecessary expense. They're not a typical office asset – they are too personal and uncontrolled. More importantly, though, there are questions to be asked about the functionality that can be provided on a mobile handset. Until we can project holographic images onto empty space, a mobile's tiny screen will be severely limiting. Perhaps the best hope is

brianc@pcw.co.uk

David Fearon worries we may not be able to **see the wood for the trees**, technologically speaking.

WAP's-a-daisy



It's encouraging to know that, in a world festooned with acronyms, even the people promoting them don't know what they mean half the time. The acronym in question is GPRS, a great technology with a boring name. After a recent

press conference at the launch of BT Cellnet's WAP-based mobile Internet Phone service, I was handed a folder with four separate releases containing three different definitions of the term. But although the company can't decide if the P in GPRS stands for Pack, Package or Packet, GPRS is one of the most interesting developments connected with buzzword of the moment and probably the silliest acronym of the last couple of years, WAP.

Now WAP, contrary to popular belief, isn't simply a pared-down version of HTML. Cut through the acronym and look at what those letters stand for – wireless application protocol – and you can see it's a whole lot more. It does include an HTML analog in the

When browsing WML pages YOU NEEDN'T CLOCK-WATCH: you'll be paying for the data you transfer, not a per-minute charge

form of WML (wireless markup language), but it also includes a whole plethora of other acronyms beginning with W, including WMLScript, which offers the ability for WAP devices to run simple server-based applications. Check out www.wapforum.org for all of the gory technical details.

Currently, BT Cellnet's Internet Phone service, based on Nokia's 7110 and Motorola's P Series WAP-enabled phones, has to run over GSM, which is circuit-switched. The phone dials up a standard connection to get Internet access, and you're effectively leasing a whole channel of the network for your private use for the duration of the connection. But GPRS, as its name suggests (when you've got it right and arrived at General Packet Radio Services) is based on IP and is thus packet-switched. So you'll be able to open a virtual socket to a server and your phone can simply chuck packets out onto the network and receive them as required without

needing to dial up – the connection is effectively permanent. This means that when you're browsing WML pages you needn't clock-watch: you'll be paying for the data you transfer, not a per-minute charge for the connection itself.

A further advantage is the fact that you'll get data transfer rates to equal or better ISDN, depending on the quality of your signal, as opposed to GSM's maximum 9.6Kbits/sec. This paves the way for daft videophones and all sorts of stuff that everyone knows we're supposed to have, now that we've reached Space Year 2000. And the good news is that BT Cellnet confidently announced that GPRS will be available for business use from the middle of the year, and for consumers some time in the autumn.

All ostensibly fairly cool stuff, but the press conference did have its dark side. The first was the video playing when we entered the conference room: a wonderfully tacky little vision of the future, including a day in the life of a businessman with a black box seemingly glued to his ear, into which he was talking constantly. And I mean constantly. Booking tickets, asking for the latest prices on his stocks and shares, scheduling meetings and the like. All apparently done by his wireless box of tricks with voice recognition, and without once talking to a real person or, in fact, looking up from the floor while scuttling around airports and hotels.

But the scariest part, back in the real world, was a couple of BT Cellnet employees. At least I assume they were employees, but it was hard to tell. Both were gripping HP Jornadas, with wireless LAN PC cards sticking out of the sides. I glanced across to them a few times, and not once did I see either of them look up from the machines or release the grip on the styluses they were using to stab at the screens every few seconds. This, you must remember, was happening in the middle of a room full of actual people who were talking to each other without – I can hardly bring myself to say it – any technological assistance whatsoever. Perhaps we were just too fleshy for them.

Sometimes you need to see something like that to remind you that technology is supposed to be a means, not an end. Being permanently connected is great, but if it means you're permanently somewhere else, it's time to think about leaving the kit at home once in a while.

davidf@pcw.co.uk

letters

Send your letters to:
The Editor, Personal Computer World
VNU House, 32-34 Broadwick Street
London W1A 2HG
or email > letters@pcw.co.uk
or fax > 020 7316 9313

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LEXON LET-DOWN

Like many other of your readers I was very impressed with your February 2000 review of the Lexon 702 PC system. I rang the company and placed an order on 6 January and was given a firm delivery date of 18 January. I specifically asked and was told that all the components for my PC were in stock.

On 15 January I received a letter informing me that due to high demand and a shortage of components my PC would not be completed until 31 January. I was obviously concerned by this and had also noticed that the company's website had disappeared (not a reassuring sign!). I rang PCW and was assured that Lexon had been vetted extremely recently. I then contacted Lexon again and, after sundry conflicting stories from various salesmen, I was again assured that this sort of delay was normal for the time of year and my PC was on its way.

I then gave them 10 days to get their act together and called again. Once more I was told that components were missing and was asked to ring again on 2 February. Before I could ring, however, my cheque was returned to me by post accompanied by a 'Dear whoever' letter explaining that my order could not be fulfilled. I am currently checking the legal position on this breach of contract.

I have thus wasted an entire month dealing with a PC company which is

apparently unable to supply a PC.

At no point has anyone called to discuss the situation since I placed the order. I have probably wasted a couple of days and dozens of phone calls trying to find out information.

Surely it is time to tighten up your reviews and only incorporate companies that can deliver.

STEVEN TEAGUE

WILL HEAD replies >

We would like to thank Mr Teague and the numerous other people who have brought this matter to our attention. When a manufacturer submits a machine for review we insist that it is available for sale to the consumer at the same price and specification and take it very seriously when this is not the case. We have launched an investigation and plan to print a full report next month.

WHEN IS 128MB NOT 128MB OF RAM?

Let me start by giving you some brief details about my computer background. I haven't any. I am 32 years old and a total beginner, but currently taking a night class in 'PC installation & maintenance'.

Four months ago I decided to buy myself a PC. As with any big purchase I bought all the magazines and read the reviews. I wanted to spend a maximum of £1,500 on a complete package that wouldn't need any upgrading in the near future. I also wanted to buy locally and from a shop, not over the phone.

First I tried Time. I was shown a system but, instead of being given a demonstration, the sales assistant began by advising me to upgrade the printer and scanner.

Next was Tiny. I found a system that I thought would suit me. When I asked the sales assistant to show me what it could do, all that he could come up with was the fact that it could show television. If I had wanted to watch TV I could have gone across the road and bought a state-of-the-art set for considerably less.

And then came the usual 'spend

LETTER OF THE MONTH

THE HIGH PRICE OF VIGILANCE

I write with reference to Nik Rawlinson's column *The High Price of Vigilance*. As a father of a five-year-old daughter - don't worry it's not one of those 'I'm a responsible parent, and you shouldn't be...' type letters. This is an 'I totally and utterly agree' letter. Too many times do the righteous 'head up their backside' type win, but someone such as yourself has the voice to express the opinion of many and I totally and utterly agree that it's down to the parents.

May I also add this is the first time I have bought the magazine and, even though I am a relative novice, I found it informative and entertaining.

ANTHONY WILKINSON

Nik Rawlinson would just like to clarify that he does not browse the Internet to find porn...

more money on a better printer and scanner'.

I decided to leave it for a while and reconsider my options.

A couple of weeks later Gateway opened a shop next door to Tiny. After looking at a few systems I was joined by the salesman who took a genuine interest in my requirements. A week later I placed my order. A Performance 500MHz system with 19in monitor, 13.6GB hard drive and 128MB SDRAM.

The system arrived earlier than expected and installation was a doddle. Everything seemed well. As I mentioned at the start of my letter I am a complete novice and, were it not for the fact that I am taking a computer course, I would probably not have discovered that my system was missing half of its memory.

I had noticed that it was only showing 64MB RAM but through my own ignorance I thought it must be a default setting and, after all, Gateway isn't going to leave out something I had paid extra for. As my skills grew I looked in the BIOS and sure enough only 64MB.

First of all I sent Gateway an email. After a few days with no reply I phoned. I was put through to six or seven different departments and finally told to take the case apart and look for myself. After doing this I phoned again, and was put through another four departments until I reached customer relations. Once again I explained my problem and was told that they had received my email and that I was right, they hadn't given me all my memory. They then said that I wasn't the only one that this had happened to and that the memory would be sent as soon as possible. No apology. Two or three weeks later the memory arrived in a small box between two pieces of foam and no anti-static bag.

How many other Gateway customers are there ignorant to the fact that they have not received what they have paid for? Were Gateway going to tell me of their mistake if I hadn't have spotted it? How many people buying computers for their children, for example, want to take the system box apart and fit new hardware?

Computers are still an expensive luxury. I hope my experience is rare.

JOHN HOLLIS

GATEWAY replies >

We are extremely sorry that Mr Hollis, a customer obviously impressed with Gateway's service and support, had his experience tainted by these problems. At Gateway we

strive to ensure that all our customers receive the highest possible level of sales service and support and are always genuinely concerned by the occasional problems they suffer.

Mr Hollis' complaint alerted us to a temporary operational problem that meant some systems were shipped with the incorrect amount of memory. As a direct result we have launched a full investigation into the incident and identified 110 customers who potentially may have been affected. We are contacting all of those customers to alert them to the issue and guide them through the process of checking memory in their PC, and if necessary, to arrange an engineer to install the module on-site.

Once again we would like to offer our sincere apologies to Mr Hollis for the inconvenience he has experienced and we will of course be compensating him in the same way as the other customers affected.

**ALEC MAYCOCK, VP CLIENT CARE
GATEWAY EMEA**

BEWARE THE IDES OF MARCH

In the March *Flashback*, the usually reliable Will Head managed to utter this cracker; '[in 1980] Pascal may have looked like it had a bright future, unfortunately now it has been relegated to the same league as Latin ... no-one in the real world uses it'.

Presumably by that, Will was excluding the one million people in the last three years who followed PCW's advice and bought a copy of Borland Visual Pascal (better known as Delphi).

Et Tu, Will.

JASON LAW

WILL HEAD replies >

While Delphi is based on Pascal, it does not use the true procedural Pascal that is still forced upon some poor unsuspecting undergraduates. Delphi has extended Pascal significantly and it is this version that may be worth learning if you are a Delphi programmer.

IS DVD NOW ILLEGAL?

I was thinking about purchasing a DVD drive recently, only to be told by no fewer than three manufacturers that, as of 1 January 2000, they can no longer sell any non-region-coded-hardware DVD equipment.

Is this true? If so, rather than improve sales of non-region 1 films, it has only persuaded me to stick with my S-VHS recorder (£199). Apart from the lack of Dolby Digital, which isn't broadcast via Digital TV anyway, there's practically no



difference between an S-VHS recording of *The Fifth Element* from Sky Digital, and the £20 hand-tweaked DVD version. In fact, none of the current range of set-top boxes have a digital video/IEEE 1394 output, so recompressing the video for digital storage will actually make it look worse than analog VHS in some cases.

S-VHS recorders can also play back and record onto VHS tapes, so I won't have to spend nearly £1,000 replacing all of my videos. I'm surprised no-one has suggested this sooner.

ANDREW BUTLER

RIYAD EMERAN replies >

First of all, retailers were never meant to sell multi-region DVD players and no manufacturer will honour a warranty for a modified player. You have the choice of either finding a shop that will do the modification for you at purchase, or you can grab a soldering iron and chip the player yourself as I did.

*As you pointed out yourself, S-VHS cannot provide Dolby Digital sound. This is one of the best features of DVD and enhances the movie-watching experience immensely, especially when coupled with a good amplifier such as the Pioneer VSA-E06 or Yamaha DSP A1. Believe me, once you've watched *The Matrix* in Dolby Digital you'll never be happy with Pro Logic again.*

I don't see what the issue is with set-top boxes not having digital output, since there is nothing that you could record the digital output to anyway, unless you're going to invest in a very early Digital-VHS deck. Also, I don't see what the lack of digital output on set-top boxes has to do with whether or not you should purchase a DVD player.

Finally, besides the lack of Dolby Digital, your S-VHS movie will lack all the extra

features such as running commentaries, behind-the-scenes footage, deleted scenes and trailers. All the reasons that true film buffs have adopted DVD. Well, that and the fact that they're considerably cheaper than the previous collectors' format: LaserDisc.

START MENU AND ABC

I have been using Windows 98 for approximately a year now and have noticed that, after a certain period, the Start Menu doesn't organise the folders and shortcuts in alphabetical order. Is there a way to rectify this and restore order to it, or am I just dabbling in the dark?

TOM BALLINGER

WILL HEAD replies >

This was starting to annoy me as well, and your letter spurred me into action. I tried a number of things, but it is actually very simple to solve: Bring up the Start Menu and then the Programs menu. With the pointer poised over this menu, right click and select 'Sort by Name' from the bottom of the pop-up menu. Hey presto, your menu will now be in order. The only problem is that you may have to do it again from time to time if you add more software.

POEM OF THE MONTH

If you can keep your computer going
when all others about you
Are losing theirs and don't know
who to blame;

If you can keep your valuable data,
And also your favourite game;
If you can recover from 'fatal exceptions',
And avoid those frozen screens,
If you can keep 'bugs' out of your system
And resist smashing it to smithereens!

If there is nothing wrong with the
scanner you have
Or the prints from your colour inkjet,
If you have disk space left on your
current hard drive
And you can download when you
go on the net;

If you can delay upgrading your system
And save hassle and extra expense,
If you're not frightened of a computer
in the future
With Artificial Intelligence!

If you can stop yourself from dreaming
Of scooping the lottery jackpot,
If your system is quite adequate
And you're pleased with what you've got;
If you're sure your computer's useful
Whether used for work or fun,

You must have the right things in it
And you'll be a happy man, my son!

BRIAN SOUTAR

WILL HEAD replies >

Can anyone follow Brian's lead and make PCW poetry corner could a regular feature?

GETTING HOLD OF OLD HARDWARE

I have come to the conclusion that technology moves too quickly!

It only seems yesterday that I was using 5.25in disks to save my code and data on. Now that I wish to revisit these disks I have discovered that technology has left them behind. I cannot get hold of a disk drive to read them.

So to save me resorting to using them as tablemats, can you help me find a way to get at the code locked away on these disks?

JOHN COLLINS

WILL HEAD replies >

You may want to have a dig around in charity shops, second-hand stores or car-boot sales. Scouring the items on offer here can often reveal the odd gem. Failing that, your answer may lie in the classified section of your local newspaper or an online auction site. Happy hunting.



NOT SO EASYPC RESTORE

I think that Mr. Butler made some excellent points about the EasyPC (*Letters* February 2000), but from a repair point of view he missed one crucial point: boot disks.

Somebody comes along and wipes out Windows or the root directory of my system, the first thing I do is get my trusty Windows boot disk out and use DOS to find the problem. If my entire hard disk is wiped, just one partition or

both are left, I can use DOS to take out all my data before I reinstall Windows.

However with an EasyPC I fail at the first hurdle: I take my trusty boot disk and try to put it in a hole that isn't there. It's easy enough to get an external USB drive, but without Windows it doesn't work, DOS has no USB support as there's been no major work on it in years. There's probably a controller on the motherboard I can use and if I'm lucky a plug on the PSU for a floppy disk with which I can botch together a floppy disk drive with some spare cables and some sticky-backed plastic, but it's still so much harder to use.

In this incarnation there are no seals on the unit, but go a step further and seal it so only the company can upgrade it, then remove all the competition and raise the price. If only the company you bought it from can upgrade it they get a monopoly and can charge what they like.

STEVE SCOTT

WILL HEAD replies >

While bootable floppies are useful, most PCs can also boot from CD-ROM. If you need to boot a dead machine into DOS you can simply put in the Windows 98 CD and tell the machine to boot from the CD-ROM first via the BIOS. From here it is simply a matter of selecting 'Start Computer with CD-ROM support' and you are away. It's also considerably quicker than booting from floppy.

BIDDERS BEWARE

Thanks for a great magazine, as always you have got the balance just right.

I have bought from online auctions six or seven times with no problems and will continue to do so, but I have a word of warning to all would-be bidders. I have been looking for a CD-RW and found some on an auction site, one caught my eye and with two days to go the highest bid was £145. Not a bad price I thought, until I checked the product number with the Dabs Direct website and found it for £123 inc VAT. I have bought some real bargains but as I say, bidders beware and always check the price against an online sales site.

STEVE YOUNG

WILL HEAD replies >

It is all too easy to get caught up in the moment and in a real-world auction you can often find yourself in a 'now or never' situation. The advantage of the online variety is that the timescale is greater, usually a few days. Use this window to your advantage and check the retail price of an item.

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Nik Rawlinson
DEPUTY EDITOR

Boxing is the key to success

Have you ever wondered why non-essential software comes in such big boxes? Something like Windows – software you actually *need* (Linux arguments aside) – arrives in a box no more than 2in thick. When it comes bundled with a PC, you get just a shrink-wrapped manual and disc. Of course, if you’ve been following the news, you’ll know that Microsoft looks set to stop supplying CDs for bundled distribution with PCs, and all you’ll get in the future is the OS installed on the hard drive and some form of BIOS-locked recovery CD (see *PCW*, January 2000, p24). This is something of a self-defeating move. By

geeky, about having a row of software boxes on a shelf. You’ll never need them again, but the vast majority of us are too materialistic to throw them away. It’s for this reason that I just don’t believe it when people say that MP3 will render the CD obsolete and products like Microsoft Reader (www.microsoft.com/reader) will replace the book. Microsoft claims that the integrated ‘ClearType’ technology ‘approximates the printed page’, but the printed page is so much more than just ink on paper.

Not only do you lose the feeling of ownership when your book exists only as binary digits stored in flash memory, but the inhuman and clinical feel of technology is not what I’d want to be

You lose the feeling of ownership when your book exists as binary digits stored in flash memory

withholding the media, the company is encouraging more people to acquire ‘pirated’ copies of the OS in case they need it in the future. Surely by bundling the original media, Microsoft ensures that the majority of copies in circulation have been paid for at some time, even if it was by the vendor and not the end user.

But I digress. Back to the boxes, because while something vital may come with minimal packaging, something entirely trivial – a clip-art collection, let’s say – will often arrive in bloated packaging, out of which fall countless cards and leaflets and, if you hunt really hard, a solitary CD. Have you ever asked yourself why something that costs £30 and isn’t essential to your system, should be packaged with so much pomp?

If you have, then you have answered your own question. You don’t *need* the clip-art collection, so the vendors have to convince you that you *want* it, and if it was just a shrink-wrapped disc, the chances are you wouldn’t be prepared to pay that much for it.

There is something inherently satisfying, although at the same time

reading in bed on a cold wintery night. No more will books be described as ‘a real page turner’. Somehow ‘compulsive scroller’ or ‘real screen refresher’ just doesn’t have the same ring. Of course, it’s not all bad. If you’re a commuter you’d be more than happy to see the demise of the broadsheet terrorist – that breed of business traveller who sits in the middle seat of a block of three and plays origami with the morning news. Shrinking him down to a PDA and some font-smoothing software would no doubt stifle acts of commuter rage.

But there’s also the technology angle. While for most of us downloading a book or encoding an album to MP3 comes as second nature, it’s still far easier to wander into a shop and buy the real thing. You don’t have to switch off a book at the end of a chapter, it has instant-on without any need to suspend to RAM, it works in poor light, it even works without batteries. The idea of an electronic future is tempting, but I doubt it’ll ever be enough to entice me to give up my physical, tangible books and CDs... no matter how fat the packaging.

	<p>VNU European Labs</p>
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VNU Labs tests all kinds of hardware and software, from PCs and modems to databases. All our tests simulate real-world use and for the most part are based on industry-standard applications such as Word, Excel, PageMaker and Paradox. Our current PC tests for both Windows 98 and NT are the SYSmark tests from BAPCo. In all our performance graphs, larger bars mean better scores.

ratings	
★★★★★	EXCELLENT
★★★★	VERY GOOD
★★★	AVERAGE
★★	BELOW AVERAGE
★	POOR



Dell Dimension XPS B800r

This is no over-clocked pretender, but **the real 800MHz deal** – yours, if you have deep enough pockets.

This is the first true 800MHz Pentium III-based PC we have seen. It is easy to over-clock a 750MHz processor so that it runs at the same speed, but hindered by a slower bus it will not achieve the sort of results you can expect from the real thing. In this instance, the 820 chipset Intel motherboard plays host to two memory slots, one of which is filled by a 128MB RDRAM module, easily recognised by its blue metallic shell. The single spare slot is occupied by the necessary blanker. Together, the processor and memory helped the B800r score a respectable 155 in our SYSmark 2000 benchmark.

Dell has a well-earned reputation for building sturdy machines fit for business or home use, and this example sits well at the higher end of the family. The processor and memory already discussed are complemented by a Dell-branded GeForce 256 graphics card with 32MB on-board. We are already familiar with this card in the pages of *PCW*, but for those who have not come across it before, it handles all transform, lighting and triangle setup on a single chip at a rate of 10 million polygons a second, freeing up the processor to get on with more important tasks – great for the gamer and no doubt responsible for the impressive score of 4,099 it achieved in 3D Mark 2000.

The hard drive is a 7,200rpm Seagate Barracuda running through an ATA-66 interface and with a formatted capacity of 26.5GB – plenty to keep all but the

most fanatical of serial installers happy for months to come. The removable storage drives, however, are both SCSI-based devices. DVD entertainment comes courtesy of Samsung, while Sony is responsible for the CD-RW. We were glad to see that Dell had included a blank CD-RW disc in the packaging, so we could get burning right away.

Sound is more than capably taken care of by a SoundBlaster Live! Value card, sending its output through a pair of Harmon Kardon speakers. This is linked to the Dell-branded V.90 modem to handle voice transmission, which is where the pre-installed Phone Tools will come in handy. Other bundled software included Adaptec Easy CD and Direct CD, McAfee VirusScan and Microsoft Office, as well as the utility software that comes with the Creative sound card.

The interior of the machine was not the tidiest we have seen. A variety of ribbon cables had not been clipped back and the audio cable linking the DVD drive and sound card was dragged across the system interior. That said, none of this was serious enough to impede the home-upgrade enthusiast. Black ducting funnelled air from the outside world directly onto the processor's heat sink – this is a good idea often seen in high-end machines.

As far as storage expansion is concerned, you'll find two free 3.5in bays with external access and one inside that can only sensibly be used for hard drives. The incumbent drive is mounted

vertically, keeping the body of the system case vacant. Of the five PCI slots, three remain free, and sticking firmly to the PC99 standard you'll see that there is no way of plugging an ISA card into the motherboard. This should not be a problem, though – apart from the realm of home networking where they are still going strong, they are becoming decidedly rare these days.

In all, this is a well-specified and built machine with enough components to impress even the most demanding of buyers. Those things about which we have complained here are small and of little significance.

NIK RAWLINSON

DETAILS

★★★★★



PRICE £2,231.33 (£1,899 ex VAT)

CONTACT Dell 0870 152 4699

www.dell.co.uk

PROS Well specced, good performance

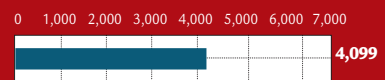
CONS Anything we put in here would just be nit-picking

OVERALL Definitely one for consideration

PERFORMANCE RESULTS



SYSmark 2000



3D Mark 2000



Carrera Lynx W533

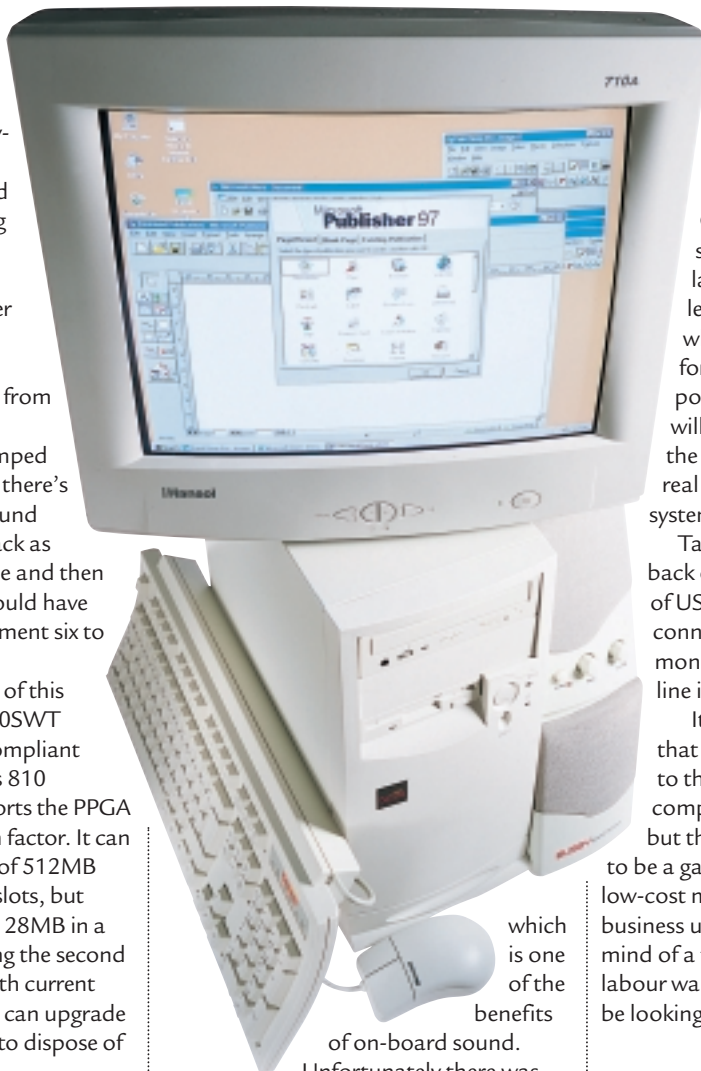
Still waiting for a powerful system with well-chosen components for an affordable price? It's arrived.

It won't be long before you'll have fewer than half a dozen components inside an entry-level PC, and that will include the drives. More and more components are being integrated onto the motherboard, making machines easier and cheaper for system integrators to construct. There are other benefits too, as can be seen from this Lynx – the case is small enough to fit on even a cramped desk, and when you open it there's plenty of room to move around inside. There's a cash payback as well – take a look at the price and then think how much less you would have got for this sort of an investment six to 12 months back.

The basic building block of this machine is a Supermicro 370SWT motherboard. This PC99-compliant MicroATX board uses Intel's 810 'Whitney' chipset and supports the PPGA 'Socket 370' processor form factor. It can accommodate a maximum of 512MB SDRAM in its two memory slots, but Carrera supplied an ample 128MB in a single PC100 module, leaving the second slot free. This means that with current memory configurations you can upgrade to 384MB without needing to dispose of what you already have.

The motherboard, sporting a 533MHz Celeron CPU, has built-in 3D/2D accelerated graphics that can support a 1,024 x 768 resolution in 24bit colour. It drives its output to a Hansol 710A monitor. Its sibling, the 710P, earned itself a 'recommended' award in our February issue. The principal difference here is that while the 710P had a 0.25mm dot pitch the 710A is slightly fatter at 0.27mm. They share a 16in viewable diagonal.

The graphics chipset also supports PAL and NTSC TV-out, and it's good to see Carrera taking advantage of this feature with a blanking plate sporting composite and S-Video connections at the back of the PC. The pay-off is the loss of one of the PCI slots – it's still vacant, it just doesn't have external access. Fortunately, two other slots remain free,



which is one of the benefits

of on-board sound. Unfortunately there was

no audio cable linking the Panasonic DVD drive to the motherboard, but we can only assume that this was a one-off oversight on Carrera's part. The drive is equivalent to a 32-speed CD-ROM.

There is one free external 5.25in drive bay, suitable for adding an internal Zip drive or CD-RW, but no internal bays left vacant, so if you want a larger hard drive you'll have to either swap out what you already have or sacrifice your external bay. The pre-installed drive is an IBM DeskSar with a formatted capacity of 12.6GB, and this is mounted vertically to leave as much free space within the system case as possible.

This pays off in the form of an exceptionally tidy system interior – possibly the tidiest we have ever seen, so if you ever open it up to slot in some more memory you won't have to battle

through a tangle of wires and will probably have the job done in five minutes.

External communications are catered for in the form of an AMR modem from M-G Communication, a V.90 device supporting 14.4K faxing. The lack of bulky internal cards leads to lower heat generation, which in turn means less need for fans. This cuts down on power consumption, but this will be of little importance to the home user, for whom the real benefit will be a quieter system overall.

Taking a quick peek around the back of the case you'll find a couple of USB ports, two PS/2 connections, parallel, serial and monitor ports and, for audio, mic, line in and line out sockets.

It's a neat little bundle at a price that makes it serious competition to the iMac. We couldn't get it to complete our 3D Mark 2000 test, but then this was never really going to be a games machine. If you need a low-cost machine primarily for serious business use, backed up by the peace of mind of a two-year on-site parts and labour warranty then you really ought to be looking at Carrera.

NIK RAWLINSON

DETAILS

★★★★★

PRICE £821.33 (£699 ex VAT)

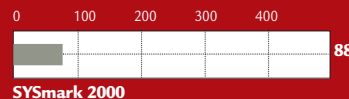
CONTACT Carrera 020 8307 2800

www.carrera.co.uk

PROS Unbeatable price, on-site warranty
CONS CD-audio cable missing in this instance
OVERALL A missing CD audio cable almost cost Carrera a star. It would have cost it some time and money too, had this machine been sent to a customer who would no doubt have taken advantage of the on-site warranty right away. Otherwise, an excellent machine that is almost impossible to fault



PERFORMANCE RESULTS



SYSMARK 2000





Armari R8-S2000

Quantity is quality when it comes to CPUs. Two PIIIs and top components make this system high class.

The term 'high-performance workstation' is commonly used to describe anything running Windows NT with a top-of-the-range processor and fast hard disk. Fortunately recent months have seen new types of memory, shiny chipsets, ever-faster I/O and, of course, with Windows 2000, a brand new workstation OS. With its track record for picking the latest and most interesting components, trust Armari then to submit its R8-2000 Workstation for review – a PC with more than a few neat tricks up its sleeve.

Some of the brand new bits pave the way for future high-performance workstations, but we'll start with the sheer muscle. The R8-2000 houses not one, but two Intel Pentium III processors, running at 733MHz each on a 133MHz front-side bus. The 733MHz CPU is one of Intel's 'Coppermine' chips, made using its finer 0.18micron process. Compared to the older 0.25micron process, used on Pentium IIIs up to 600MHz, the newer process allows faster speeds and lower power consumption, all while generating less heat and boasting a higher yield. (Note that Intel also makes a Coppermine version of the 600MHz Pentium III, labelled with an E).

The finer process also allowed Intel to

take the Level 2 cache out of the CPU cartridge and integrate it directly onto the processor die. An on-die cache runs at the same speed as the CPU, compared to the half-speed cache on 0.25micron chips. Intel may have halved the Level 2 cache size from 512KB to 256KB, but running this smaller cache at full speed results in better overall performance.

Handling Armari's two CPUs is Windows NT4/SP5 with a free upgrade to Windows 2000. A pair of 128MB PC100 SDRAM DIMMs give a total system memory of 256MB, while a huge 27.3GB IBM DeskStar 7,200rpm UDMA66 hard disk provides plenty of storage. The top two drive bays house a Pioneer 10-speed DVD-ROM drive (40-speed CD) and an AOpen CD-rewriter (six-speed write, four-speed rewrite, 20-speed read). CD-rewriters that also read DVD discs are now available, but keeping them as separate drives allows you to easily duplicate CDs.

Finally, a Guillemot 3D Prophet DDR-DVI AGP 4X graphics card burns through games with its blinding nVIDIA GeForce 256 processor. More on that later, but first let's look at the most exciting component in the entire system: the motherboard.

The Supercircuits PIIDME Armari has

chosen is the first motherboard we've tested that uses Intel's new 840 chipset, designed for servers and high-performance workstations. There's been so much press about Intel's entry-level 810 and memory-challenged 820 chipsets that the 840 has tragically been ignored by many. That's a shame as it offers many features that could make it the chipset of choice for demanding users.

Like the other 800-series chipsets, the 840 employs a modular design, based on three core components and several optional extras. Most important, and physically largest is the 82840 Memory Controller Hub that provides support for AGP 2X/4X graphics cards, multiple PCI segments and, uniquely, dual RDRAM memory channels, more of which in a moment.

The 82801 I/O controller hub sorts out the 32bit PCI bus, UDMA66 IDE controllers and USB ports, while the 82802 Firmware Hub stores system and video BIOS, along with providing Intel's Random Number Generator that comes up with figures to help with stronger encryption and security.

The 840 chipset was designed to only use a new type of memory – RDRAM – that offers higher performance than conventional SDRAM. During its design,

it was thought that RDRAM would be readily available at the time of the new chipset's launch, but as anyone who's followed memory knows, it has been a turbulent ride. RDRAM is now available, but costing around three times that of SDRAM, it simply doesn't result in competitively priced systems.

Motherboard manufacturers and system integrators claimed their customers wanted an SDRAM option, so

With Windows NT or 2000, dual-CPU systems will benefit any day-to-day tasks

Intel came up with a solution that would allow 800-series chipsets to use SDRAM. Called the Memory Translator Hub (MTH), it translates the RDRAM protocol into SDRAM-based signals, allowing motherboard manufacturers to fit DIMM slots for conventional memory. Some boards come with both RDRAM and SDRAM slots (although you can't use both types simultaneously), but Supermicro's PIIDME motherboard features DIMM slots for SDRAM only.

Sadly, Intel's MTH only supports 100MHz SDRAM, and not the faster 133MHz variety that is becoming increasingly common in VIA-based chipset solutions. Rather more sinister, using 100MHz SDRAM with the 800 chipset, MTH actually results in lower memory performance than putting it in a motherboard with an older Intel BX chipset. Intel readily admits this is the case and estimates a drop in memory performance of around five per cent. Armari, however, believes it's closer to 25 per cent, based on results using the Wstream memory benchmarking software (www.cs.virginia.edu/stream/). Most people, though, believe the additional benefits of the new chipset outweigh its lower SDRAM performance.

The most exciting benefit, that is only available on the 840 chipset, is support for dual RDRAM memory channels. Normally the RDRAM channel operates at 1.6Gbytes/sec, but using a pair simultaneously effectively doubles your memory bandwidth to 3.2Gbytes/sec. Supermicro has done the right thing, and rather than fit just one MTH for SDRAM support, it has popped one on each RDRAM channel. This means the SDRAM memory bandwidth is doubled.

Armari reckons that, although each SDRAM channel operates at about 75 per cent of that on a BX chipset, having

two of them running simultaneously results in 50 per cent higher performance overall – think of it as not PC200, but rather PC150. While not supplying quite the same level of performance as RDRAM, this 50 per cent higher speed than on a BX chipset delivers the required bandwidth to support the 1Gbyte/sec transfers that AGP 4X demands, while keeping memory costs down. The Supermicro board has four

DIMM slots, supporting up to 4GB of PC100 SDRAM.

The 840 chipset also offers support for 64bit PCI with the optional 82806 64bit PCI Controller Hub. Supermicro has fitted this to the PIIDME motherboard, which supports a pair of 64bit PCI slots, running at 33 or 66MHz. Supermicro also does a version of the PIIDME with the latest Adaptec Ultra 160 SCSI on-board. This reassuringly runs on the 64bit PCI bus and features on-board Ultra 160-LVD, Ultra Wide and 50-pin Ultra connectors.

It seems almost boring now to list the more conventional motherboard components, but for the record, there's a pair of UDMA66 channels, four 32bit PCI slots, one AGP 2X/4X slot, and all the usual ATX ports, along with the welcome inclusion of 10/100 Ethernet. Finally, the heat-sinked 840 components are turned 45 degrees to cater for precise track routing – the fact they look like pretty diamonds is an unexpected bonus.

Only one PCI slot is occupied, and that's with a Creative Labs SoundBlaster Live!1024. The SB Live cards support positional 3D audio using EAX with four-channel output, and Armari has catered for this by supplying Cambridge SoundWorks PCWorks FourPoint surround speaker system – see *Hands On, Hardware* for more on positional audio.

We were pleased to see the excellent Iiyama VisionMaster Pro 450 19in monitor, with its natural flat Mitsubishi Diamondtron NF tube, plus support for extremely high flicker-free resolutions – 1,600 x 1,200 at 90Hz or 1,280 x 1,024 at 110Hz. A Logitech cordless keyboard and mouse complete a great package.

So, who would benefit from a dual-CPU system such as this? Armari cites those involved in rendering 3D graphics. However, with Windows NT or 2000 behind the scenes, dual-CPU systems will

benefit any day-to-day tasks, such as farming out print jobs to one chip while leaving the other free for applications – in general, dual-CPU systems just feel so much more responsive, and are recommended over a single faster CPU.

Using industry standard benchmarks for dual-processor testing, Linpack results showed that the Armari could perform burst processing at a rate of 238.7mflops in single-processor mode, rising to 460.5mflops when the load was split across both processors. Linpack provides a more accurate example of how the machine would perform under normal circumstances, with 184.9mflops in single-processor mode, and 313mflops in dual. In both instances these results show that in terms of raw speed the dual-processor configuration truly does run twice as fast as the single.

With a Dual Data Rate GeForce 256 graphics card we couldn't help but fire up Quake III Arena. Using the same demo as in December's group test, we measured 83.6fps at 1,024 x 768 in 16bit colour. Activating Quake Arena's SMP mode (`r_smp 1` at the console) woke our second CPU and raised the score to 87.3fps; the second CPU really comes into its own during intensive battles though. Compare these impressive numbers to December's highest score of 62.2fps for an Asus AGP-V3800 Deluxe under a 600MHz PIII.

The R8-S2000 is a cracking machine for developers, renderers, or anyone who fancies an unbelievably responsive system. The build quality and choice of components from Armari are, as usual, superb – and the 840 chipset in particular looks like it could beat at the heart of this year's highest-performing PCs.

GORDON LAING

DETAILS

★★★★★

PRICE £2,799 (£3,288.83 inc VAT)

CONTACT Armari 020 8993 4111

www.armari.com

PROS Keeping costs down with SDRAM while still benefiting from the 840 chipset's dual memory channels

CONS No RDRAM memory upgrade path – but does it matter?

OVERALL Supremely responsive system with innovative components

PERFORMANCE RESULTS



SYSmark 2000



Toshiba Equium 2000

A novel PC, standing somewhere between a desktop and notebook, proves that **style can be bought.**

The iMac made a statement by standing out from the crowd, but it was a love-it-or-hate-it machine. Toshiba's latest release, the Equium 2000, however, while similarly trend-bucking, can't fail but appeal to everyone who sees it – as far as looks are concerned, anyway.

The sleek 'L' shaped stand hides an entire PC, fronted



by a rather impressive TFT display. All-in-one units such as this sit well with this kind of digital panel, as there is no need for a digital to analog to digital conversion process and less chance of any interference. Our test machine had an unfortunate glitch that caused the monitor to flicker, but that is likely to be a one-off problem that won't affect the units released to market. At 15in, it has a native resolution of 1,024 x 768 and, the

occasional flicker aside, was pleasant to use for extended periods. It is controlled by an ATi Rage 128 VR chipset with 8MB of RAM.

The hub of the machine is a 466MHz Celeron processor, backed up by 64MB of RAM. There is a spare slot to add more memory at a later date, but to get to it you'll need to remove a small backplate. This may be a daunting prospect for the novice, but it's still less than you might need to remove if you had instead opted for a regular desktop PC. The hard drive, however, proved more difficult to access, so if you think you might need more than the supplied 6GB any time soon, perhaps this is not the best PC for you.

Toshiba has a good reputation in the notebook market and so the Equium 2000 is a logical addition to its product line – a number of notebook components are used in its construction. In the side of the stand you'll find a couple of PC Card slots. It's a shame that they are positioned so high because it means that any trailing wires will stick out of the side of the unit, that could be somewhat unsightly – positioning them lower down would have been preferable.

Another area where wires are somewhat fiddly is around the back. The power and USB keyboard cables must be inserted upside down and then twisted around so that they are pointing through a small cover which can be put across them. While this is unlikely to cause any damage as long as you are not constantly connecting and disconnecting them, we're sure there could have been a better way to have achieved a similar result.

Another notebook-esque addition is the 'SelectBay' that sits behind a flip-down front cover. This slim slot will take either a floppy or 24-speed Teac CD-ROM drive, both of which are supplied. A lever at the back of the unit will hold them securely in place. A small window

in this cover gives you access to the IrDA port, which is a welcome addition to what is, ultimately, a desktop machine. Unfortunately, the Equium 2000 was unable to complete the SYSmark 2000 benchmark, but did achieve 163 in SYSmark 98. This is not comparable with the other scores in this issue, and puts it around the same level as the 466MHz Gateway Profile 2 (PCW, Feb 2000, p78).

External connectivity is provided for in the shape of USB and an Intel 10/100 Ethernet controller. There are ports for headphones, mic and line in and, although there are a couple of internal speakers, you might want to consider investing in an external set if you're at all serious about your music. The two USB ports are in place of any other peripheral connectors, so if you have only a parallel printer it's worth bearing this in mind before making a purchase.

At £1,775 ex VAT you're paying about what you would for a similarly specced notebook, so you really have to choose whether you want a flash desktop or a more portable machine. That said, it will look great in front-of-house situations such as office receptions, particularly as, in that sort of a situation, a network would be likely to handle any printing requirements, but may be less suited to the home user.

NIK RAWLINSON

DETAILS

★★★★

PRICE £2,085.63 (£1,775 ex VAT)

CONTACT Toshiba 01932 828 828

www.toshiba.co.uk/computers/

PROS Attractive, good screen

CONS An average spec but nothing more

OVERALL If looks are important then the Equium would be a solid addition to any home or office, but would a notebook suit you better?

PERFORMANCE RESULTS



SYSmark 98



3DMark 2000: 862

Mesh Matrix 850 Maxx

The fastest conventionally cooled PC gives you a whopping 850MHz to throw around the desktop.

As has so often been the case of late, AMD has stolen the march on Intel this month. As we go to press, the pinnacle of Intel's processor achievement is an 800MHz Pentium III (see review, p72). AMD, on the other hand, has squeezed an extra 50MHz out of the Athlon. Of course, it's been said before that clock speed alone is only one part of the computing speed equation, but with the Athlon and the Pentium III so closely matched in many tests, for those who need the fastest performance it's a key factor.

The processor isn't the only interesting part of the Matrix 850 Maxx. As the name suggests, it's fitted with ATI's newest power graphics card, the Rage Fury MAXX. Unable to come up with the architectural advances to match nVIDIA's transform and lighting geometry engine, the Fury MAXX resorts to brute force, with two graphics processors on-board, each with 32MB of memory to itself.

This is similar to the concept of a pair of 3dfx Voodoo2 cards running in SLI (scan line interleaving) mode, except each of the Fury MAXX's Rage 128 Pro chipsets calculates every other frame, rather than every other line of each frame. The MAXX drives a 19in Taxan ErgoVision 980TCO99 monitor, with Diamondtron NF flat-screen tube. At 1,280 x 1,024, this gives sharp, vibrant results, but can't provide enough definition at 1,600 x 1,200 to make this resolution comfortable.

Inside the Matrix is an Asus K7M motherboard, with AMD's 751 chipset. A 128MB SDRAM DIMM is fitted in one of its three DIMM sockets. Sensible enough for a Windows 98 machine, but for the potential buyer of this system it's likely that 256MB would be more appropriate, as an upgrade to Windows 2000 would be more than probable.

The hard drive is the 27GB variant of IBM's DeskStar 34GXP range. This is among the fastest of IBM's EIDE drives, with the data squeezed onto four platters, a spindle speed of 7,200rpm and a 2MB data buffer. The K7M has an AMR (audio-modem riser) slot that isn't used in this system, but Mesh has taken advantage of the consequent free blanking

plate and installed two extra USB ports, bringing the total to four.

Aside from the core components, the Matrix has peripherals aplenty. With the system out on the test bench, it's hard not to notice the Microsoft Intelli Explorer mouse, with silver finish and red LED tail light. And although it's large, there's no doubting that the optical sensing works better than conventional methods. A Microsoft Internet keyboard with dedicated application shortcut keys complements the shiny rodent.

The three 5.25in device bays are occupied by a Pioneer 10-speed DVD-ROM drive, Iomega ZipCD 650 CD-RW drive, and the Creative Live! Drive II, which is part of the SoundBlaster Live! Platinum fitted to the system. The Live! Drive will be supremely useful for the PC musician, but for other users its plethora of inputs and outputs will be overkill. There's nothing to stop you taking it out and using the drive bay for something else though: the sound card itself will work perfectly well without it.

A second extra peripheral that comes with the Platinum is the digital DIN connector, which sits in a blanking plate and consequently blocks the K7M's single shared PCI/ISA slot. Again, there's nothing to stop you removing it if needs be. With the SoundBlaster and a Diamond Supra 56K modem taking up two PCI slots, there are two free PCI slots left to use before you need to take out the digital DIN. A set of Labtec LCS-2514 speakers gives reasonable sound quality,

but lacks the centre dialogue speaker necessary to take full advantage of Dolby Digital DVD soundtracks. Office applications are adequately catered for with Corel's WordPerfect Office 2000 suite.

In our SYSmark 2000 application benchmark suite, the Matrix 850 beats Dell's PIII 800 to become the fastest conventionally-cooled PC we've seen. The difference is marginal, though, and AMD needs to roll out Athlons with on-die Level 2 cache to keep its lead over Intel's Pentium III Coppermines secure.

DAVID FEARON



DETAILS

★★★★★

PRICE £2,349 (£1,999 ex VAT)

CONTACT Mesh 020 8208 4706

www.meshplc.co.uk

PROS Fast as you like, great peripherals

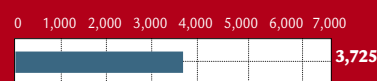
CONS You'll pay the usual price premium for cutting-edge technology, a GeForce-based graphics card is a better long-term bet

OVERALL AMD continues to provide the fastest performance available, and the Matrix 850 Maxx is a fine system overall

PERFORMANCE RESULTS



SYSmark2000



3DMark 2000

Atlas Meridian A850

AMD's fastest chip and great components make this a muscle-bound PC that exudes quality.

It seems like AMD Athlon 850 machines are like buses, you wait for ages for one to arrive and then two come along at once. It is good to note, however, that both the 850MHz Athlon systems featured this month are first-rate machines that make the most of AMD's fastest chip.

The Atlas Meridian A850 is an extremely well-specified machine, sporting just about everything you're likely to need from a high-end system. Every base is covered and you can use this machine for business or for playing the latest 3D games.

The motherboard sports three DIMM sockets, one of which is filled with the 128MB of system RAM. There are also three free PCI and two free ISA slots. The system case also has ample upgrade options with single external 5.25in and 3.5in bays free. There's also a spare internal 3.5in bay for a second hard disk.

Every base is covered and you can use this machine for business or the latest 3D games

That said, you shouldn't need to change the hard disk too soon as the IBM Deskstar currently installed has an impressive 22GB capacity. The secondary EIDE channel is full to capacity with a 10-speed Pioneer DVD-ROM drive and a Mitsumi CD-RW drive both connected to it. The latter is a good inclusion, allowing you to safely archive and back up data to cheap media. You can also put together music compilations from your CD collection (as long as you own the originals of course).

Filling the AGP slot is a very impressive graphics card, the Hercules 3D Prophet DDR-DVI. This is a very fast card that takes advantage of Double Data Rate memory for improved performance. As such, it turned in a



3DMark 2000 score of 4,465 compared to 3,725 on the Mesh. The Prophet also has the added advantage of a DVI connector. This new port allows you to connect the machine to a correspondingly equipped LCD flat panel digitally. This produces far better image quality, since the signal isn't being changed to analog, sent down a cable, and then switched back to digital again.

Even if you don't rush out and buy a digital flat panel, you won't be disappointed with the monitor that Atlas

has supplied. The Mitsubishi Diamond Pro 900u is a fine example of a CRT display. The tube is Mitsubishi's own 19in natural flat Dimondtron model and it produces a flat image with little reflection. The focus and colour purity are also impressive and you can happily work for hours at a resolution of 1,280 x 1,024 without any chance of eye strain.

Taking care of sound is an Aureal Vortex 2 card. This is not as fully featured as a SoundBlaster Live! Platinum but will suit most users' needs. The A3D standard produces great positional audio effects for games and the 850MHz CPU should keep things running smoothly when it's employed. If you want to record digitally from your PC, there's an optical digital output on the card. The Diamond Pro-

Media speakers are reasonable, but we would have liked to have seen a surround setup to take advantage of the Aureal card.

Diamond is also responsible for the modem. The Diamond SupraExpress is V.90 compatible and comes with a splitter jack so it can share the same socket as your phone.

The keyboard is a fairly standard affair with a reasonable typing action, while the

wheel mouse worked well enough, although a Microsoft version would have been better.

Rounding off the package is a copy of Lotus SmartSuite Millennium, providing the machine with full office productivity straight out of the box.

Atlas has demonstrated exactly how to showcase a new processor. The Meridian A850 is fast and well featured, but it's also affordable. Even though £1,795 is a lot of money, you're getting a lot of high-quality components.

If you're after the latest that AMD has to offer, the Meridian A850 should be at the top of your list.

RIYAD EMERAN

DETAILS

★★★★★



PRICE £2,109.12 (£1,795 ex VAT)

CONTACT Atlas 07000 285 275

www.atlasplc.com

PROS Fast, excellent graphics card and monitor

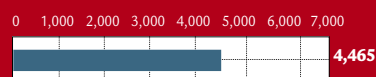
CONS No surround speakers

OVERALL A fabulous power system at a great price

PERFORMANCE RESULTS



SYSmark2000



3DMark 2000



Micron Millennia 750

If size and style aren't important to you but performance is, then the Millennia 750 could be for you.

The Micron Millennia 750 is an imposing machine in more ways than one. Our first impression of the PC was its sheer size – the case is huge and it comes with a 19in monitor, so you will need to have plenty of space to accommodate its bulk. But it's not just on the outside that this computer stands out from the crowd – it is one of the fastest systems on the market, too.

It is powered by an Intel processor – a 750MHz Pentium III, which runs at 100MHz front-side bus (FSB), ensuring it an impressive score in our SYSmark 2000 performance test. We had a bit more trouble with our 3DMark 2000 graphics benchmark, because the drivers installed for the 32MB GeForce 256 graphics card weren't the latest version. After installing the new drivers we were able to run the test without a problem and the Millennia managed a score of 4,017. This is an impressive result reflecting the PC's superior graphics performance.

The GeForce 256 card ensures high performance, even for the most demanding 3D games. Support for T&L future-proofs the card, and when the much anticipated games that can take advantage of this feature come onto the market you will see even better graphics performance on this PC.

This is not the only future-proofing feature you'll find inside the PC. Take the side off the beige and silver case and you will see a free socket on the motherboard for Intel's PIII Socket 370

bulk up the 128MB of PC100 SDRAM by filling up the two available DIMM slots, but one thing upgrade addicts should note is the

blue plastic flip-down cover inside the case that felt flimsy to the touch, so if you do spend a lot of time working in your PC this may not last too long.

While there is the opportunity to upgrade, the specification you get as standard isn't bad – alongside the generous allocation of RAM, super-fast processor and graphics card you also get a massive 20.5GB hard drive, eight-speed DVD-ROM drive and an Iomega Zip 250.

The 19in Diamondtron monitor easily lives up to the standards set by the rest of the PC. With a slot pitch of 0.25mm and a maximum resolution of 1,600 x 1,200, this screen is a pleasure

to work at, as long as you have the desk space to accommodate it. Unfortunately, the keyboard and mouse aren't quite as inspiring, as they are just standard models, although it is a Microsoft Intellimouse.

Although most users would be impressed by the specification of the PC, whether they would be as pleased with the styling is another matter. As well as its bulk, this PC has a silver trim that is



supposed to look futuristic, although we weren't particularly enamoured of it. There is a flap that covers the drive bays that we weren't too happy with either – in our experience these just get in the way, and can break off with careless use.

As well as an impressive hardware line-up, the Millennia sports a copy of Microsoft Office SBE. This is the premier office suite and rounds the package off well.

URSULA TOLAINI

The 19in Diamondtron monitor is a pleasure to work at, if you have enough desk space for it

Flip Chip, the Celeron-style chip that runs cooler (and potentially faster) than a conventional PIII. There is also scope to add extra cooling fans – one for the CPU and one for the PCI cards, so overclocking for speedier performance is a distinct possibility.

There is room to add extra devices into the four free bays – two 5.25in and two 3.5in, or cards into the three PCI and one shared PCI/ISA slots. You can

DETAILS

★★★★

PRICE £1,938.75 (£1,650 ex VAT)

CONTACT Top PC 0113 242 2416

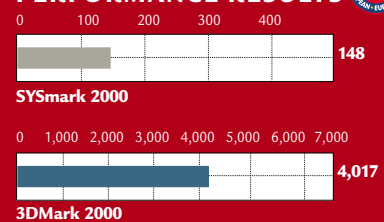
www.toppc.co.uk

PROS Fast performance, upgrade opportunities

CONS Poor case design

OVERALL If you have the space to house the Millennia, and don't find the design too ugly, this PC is a state-of-the-art piece of kit that will speed through any application you throw at it

PERFORMANCE RESULTS



Fujitsu PenCentra 130

If flimsy handhelds are **proving a headache** in the rough workplace, this tablet could be the

Despite the vast market lead that Palm and Psion have established in the palm-size and handheld PC markets, Microsoft is continuing to make inroads with its own Windows CE operating system. While the Palm range still dominates the consumer pocket PC market, Windows CE is rapidly gaining popularity in the more lucrative corporate market, where its similarity to the Windows desktop interface is favoured

as a means of cutting retraining costs for staff.

The PenCentra 130 is Fujitsu's first serious move into the CE market. It is a touch-sensitive tablet, measuring 22.86 x 15.24 x 3.30mm (or roughly two and a half times the size of the average colour CE pocket PC) and packs an 8in

SSTN or DSTN (on our review unit) colour display. Essentially, the PenCentra is a smaller, cut-down version of its big brother, the Windows 98-based Stylistic LT. OS storage is on a 24MB ROM, with user-accessible 16MB of SDRAM (upgradable to 48MB) and 8MB of battery backed-up storage (upgradable to 16MB).

Given its intended use (industrial rather than domestic), the first thing that strikes you about the PenCentra is the rugged build quality. The unit is absolutely solid, with the edges coated in stiff rubber for improved grip and to protect it from wear and tear. The normally fragile display is equally robust, and even the stylus is thick enough to withstand being dropped, crushed or thrown about (compared with most styluses that snap easily). Despite this, it still weighs in at just 0.9kg, and that's including the battery.

In operation, the PenCentra works much like a CE sub-notebook, although

minus the attached keyboard. It uses version 2.1 of CE, coupled with the handheld application set of Pocket Office (Word, Excel, Access, PowerPoint and Outlook), Internet Explorer, a selection of Fujitsu's own CE utilities coupled with an array of third-party software tools, including handwriting recognition tools and fax utilities.

The 131MHz MIPS CPU provides more than enough horsepower to drive the unit, although in tests it consistently

and headphone jacks, a PS/2 keyboard/mouse shared port, and an infrared interface.

There is sadly one screaming omission from the PenCentra, and that is a modem of any description. US and Canadian models feature a 56K V.90 modem, but nothing similar is included if you're buying it on the UK market.

However, what this device really needs is a wireless LAN interface. You can easily add one by means of a PC Card slot, but given the PenCentra's intended markets this should really be standard kit.

The interchangeable lithium-ion battery pack's life is estimated at 10 hours, however, in tests we consistently measured it at

nearer 13 hours,

which for a device with such a large colour screen is particularly impressive.

Overall, the PenCentra is an excellent device and one that we would struggle to fault. With the exception of the modem issue it effortlessly achieves what nearly all the

leading pocket PC manufacturers have yet to do – to create a pen-based embedded PC that can stand up to the wear and tear of an industrial environment. As good as most pocket PCs are, they are simply unable stand up to the rigours of non-domestic use quite like the PenCentra.

Input is mainly stylus-based, using either handwriting recognition or point-and-click. Where heavy typing is necessary, you can resort to an external keyboard, and similarly where finer control is warranted, a mouse can also be used. The bundled docking station ensures a good working angle along with the necessary port replication.

There is no shortage of expansion capabilities on the PenCentra. Despite its compactness, it still manages to squeeze in two Type II PC Card slots with Compact Flash memory and peripheral support, a serial port (primarily for sync use), a USB port, microphone



CHRIS GREEN

DETAILS

★★★★★

PRICE £1,139.75 (€970 ex VAT)

CONTACT Fujitsu 020 8573 4444

www.fpsi.fujitsu.com

PROS Very light, large, clear screen, plenty of expansion ports

CONS No built-in modem or wireless comms device, poor audio playback

OVERALL In an industrial environment, the PenCentra is far more practical for entering and viewing data than a pocket PC or CE sub-notebook

Dell Inspiron 5000

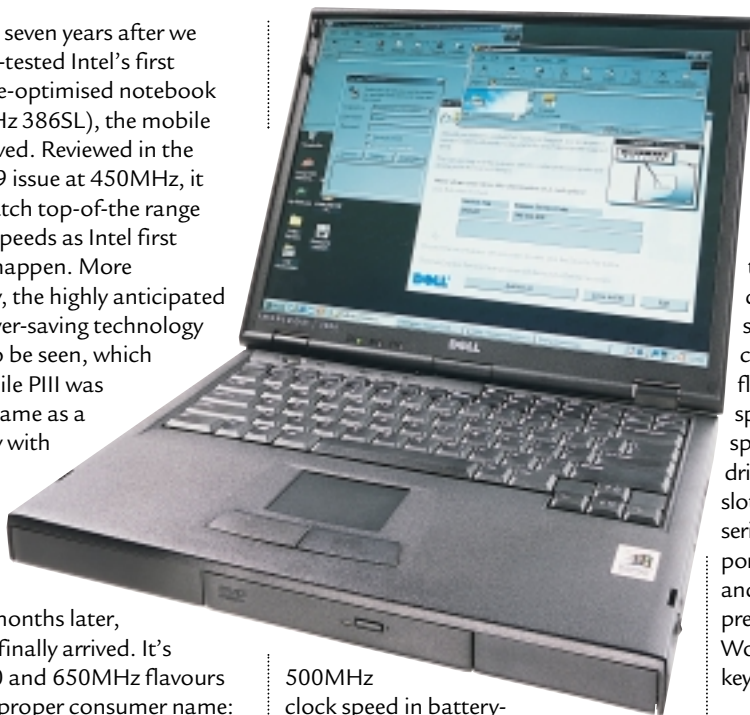
Embracing the new SpeedStep technology Dell has produced a notebook that's difficult to fault.

Around seven years after we group-tested Intel's first mobile-optimised notebook chip (the 20MHz 386SL), the mobile Pentium III arrived. Reviewed in the December 1999 issue at 450MHz, it didn't quite match top-of-the-range desktop clock speeds as Intel first implied might happen. More disappointingly, the highly anticipated Geyserville power-saving technology was nowhere to be seen, which meant the mobile PIII was essentially the same as a mobile PII, only with 100MHz FSB, streaming extensions and slightly higher clock speeds.

Now, four months later, Geyserville has finally arrived. It's available in 600 and 650MHz flavours and now has a proper consumer name: SpeedStep. Dell's Inspiron 5000 is one of the first SpeedStep notebooks we've had the chance to test in the *Reviews* section, although you'll find a model from HP in this month's notebook group test.

The whole concept behind SpeedStep is to save power without overly compromising performance. Previously to double battery life, you had to halve the clock speed. Sure, a 600MHz notebook could last twice as long when running at 300MHz, but that's quite a performance hit. SpeedStep, however, saves power by being the first processor that can switch its operating voltage on-the-fly. Under mains power, the chip runs at 1.6V, but automatically switches in a split second to 1.35V when you pull the plug; returning the mains supply switches the voltage back up to 1.6V again, without the need for a system or even application restart.

The advantage of voltage switching is obvious to anyone who remembers their physics classes: Power is proportional to the square of voltage, which means even a small voltage drop results in a big power saving. Intel reckons the power consumption could drop by as much as 40 per cent while retaining 80 per cent of the original performance. In practice, both the 650 and 600MHz SpeedStep processors drop to a still respectable



500MHz clock speed in battery-saving mode, but consume just under half the power.

So does it work? In a word, yes. Windows or the user can tell it when to switch, whether in the absence of mains power, or for temporarily over-riding back to maximum performance for, say, demanding presentations on the move. The Inspiron 5000 behaved impeccably, running active applications and even uninterrupted video streams while we constantly connected and disconnected the power supply; disconnected you're looking at a maximum of three hours under a single battery.

Of course, the whole idea of a fast PIII notebook is to match or even replace your desktop PC, and the Inspiron 5000 delivers in spades. Our review model came with a 12GB hard disk, 128MB of RAM (expandable to 512MB using two SODIMMs), and a whopping 15in XGA display; Dell now offers a 15in SXGA+ TFT display option which supports 1,400 x 1,050 resolution. Admittedly both 15in screens overhang by 3mm on the sides and 8mm at the front, but their sheer real estate is vast and welcome to anyone replacing their desktop PC.

Graphics are supplied by an ATi Rage Mobility P chipset with 8MB of SGRAM. Optimised to save power, it's not bad if you're on the move, but this is one area

where a notebook will never replace the power-hungry 3D accelerators of desktop PCs - we measured *Quake III Arena Demo2* at only 16.7fps in 16bit VGA and 8.2fps in XGA.

At the front-centre of the unit is Dell's media bay, which can take a second battery, CD or Zip drive, or in the case of our model, a six-speed DVD drive. DVD movie playback at full-screen, even under battery power or constant SpeedStep switching, was flawless; the side-mounted stereo speakers may be tinny, but impress with spatial imaging. On the left is a floppy drive and modem, while a pair of PC Card slots sit on the right. Round the back are serial, parallel, PS/2, USB, VGA and IR ports, along with a PCI docking connector and an S-Video output. Our model came pre-installed with Windows 98SE and Works Suite 2000, and the full-size keyboard was very comfortable to use.

The new Inspiron 5000 series has slimmed down to 40.4mm thick, even with the 15in display option. The unit's footprint is 324 x 259mm and it weighs 3.37kg with DVD and floppy drive.

Best of all, though, is the price. While perhaps not the most aspirational badge or sexiest design in the portable world, Dell has always sold top-of-the-range notebooks at highly competitive prices. Considering ours was fitted with Intel's latest and greatest mobile chip, accompanied by an impressive overall specification, Dell's asking price of £1,899 ex VAT sounds like a bit of a bargain.

GORDON LAING

DETAILS

★★★★★

PRICE £2,231 (£1,899 ex VAT)

CONTACT Dell 0870 907 5869

www.dell.co.uk

PROS Huge screen, great configuration

CONS Design not as sexy as some more expensive brands

OVERALL Bargain access to Intel's latest mobile chip

PERFORMANCE RESULTS

0 100 200 300 400



SYSmark 2000



Hi-Grade UltiNote AS8400

A fast notebook that makes use of the **SpeedStep CPU**.

Intel's mobile Pentium III processors have to some extent been advancing more quickly than its desktop equivalents recently – the mobile PIII was the first to move to a 0.18micron fabrication process and bring the Level 2 cache on-die. Hi-Grade's UltiNote AS8400 is fitted with the latest evolution in mobile PIIIs – a 650MHz Pentium III SpeedStep CPU.

While running on mains power, the SpeedStep 650 runs at its full 650MHz. Switch to battery power and it automatically clocks itself down to 500MHz. Nothing too special there: desktop systems have been able to throttle back in power-saving mode for years. The clever bit is that as well as throttling back the clock rate, the SpeedStep system also reduces the processor's supply voltage from 1.6V down to 1.35V. Because power dissipation increases with the square of the supply voltage, that small reduction makes a big difference to the power consumed by the processor. Intel quotes that in maximum performance mode the CPU consumes 9.1W, reducing to 5.1W in battery mode. This made a 10-minute difference to its operational life: on batteries it lasted two hours with SpeedStep enabled, and one hour, 50 minutes with it turned off.

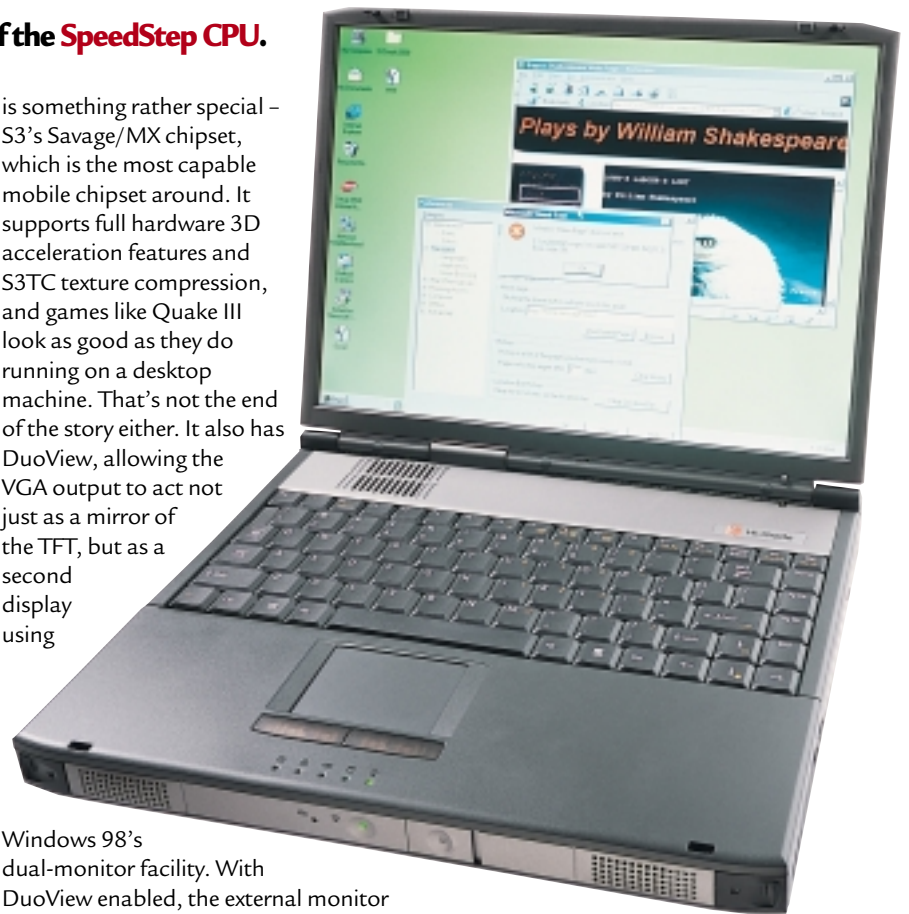
Open up the lid of the UltiNote and it looks distinctly ordinary at first sight – your standard high-end notebook with 14.1in TFT. But looking a little more closely reveals several features you don't see every day. The unit doesn't come with swappable floppy or DVD-ROM drives for the simple reason that there aren't any swappable devices. Both floppy and DVD-ROM are integrated into the right-hand side of the machine and are non-removable. The only part that can be removed in everyday use is the lithium-ion battery, which can't be swapped for other devices as it can with some notebooks. Not only are floppy and DVD-ROM drives integrated into the system, there's also an integrated combination 56K modem and 10/100BaseT network adaptor, both sharing a common RJ45 connector. Next to this, there are two USB ports as opposed to the more usual one.

The graphics adaptor in the UltiNote

is something rather special – S3's Savage/MX chipset, which is the most capable mobile chipset around. It supports full hardware 3D acceleration features and S3TC texture compression, and games like Quake III look as good as they do running on a desktop machine. That's not the end of the story either. It also has DuoView, allowing the VGA output to act not just as a mirror of the TFT, but as a second display using

Windows 98's dual-monitor facility. With DuoView enabled, the external monitor becomes an extension of the desktop, allowing you to run separate applications in each one – a PowerPoint presentation on an external CRT and your private accompanying notes on the LCD, for instance. The TFT screen itself is no better or worse than most of the competition, with a native resolution of 1,024 x 768 and pin-sharp clarity, but a less than perfect viewing angle that leads to an apparent brightness variation across the screen. Inside the case lurks 192MB of RAM and an IBM Travelstar hard disk of no less than 12GB in size.

With all of the hardware stuffed into the relatively compact case of the UltiNote – a reasonably slim 40mm high with the lid closed – the build quality has suffered rather. Pick the unit up and the case flexes noticeably, giving a feeling that this isn't a unit for the true road warrior. There's not too much room for the keyboard either, and it produces a rattly and fairly lifeless typing experience. The touchpad is, however, placed so that accidental-clicking syndrome from the heel of a hand brushing over it while typing isn't a problem.



The UltiNote is a most impressive beast as far as the density of technological innovations goes – we've rarely seen a notebook that packs so much hardware. The price, given the specs, is also remarkable. The 650MHz processor coupled with the Savage/MX makes it an easy match for many desktop systems performance-wise. The desktop, however, is probably the place to leave it for the most part – it just feels too flimsy to seriously rival IBM's or Sony's portables for those who are truly mobile, which renders the presence of the SpeedStep CPU something of a moot point.

DAVID FEARON

DETAILS

★★★★★

PRICE £2,272.45 (£1,934 ex VAT)

CONTACT Hi-Grade 020 8532 6123

www.higrade.com

PROS Full to bursting with top-notch hardware
CONS Build quality is poor and the keyboard is limp

OVERALL One of the fastest notebook we've seen, but not the most inspiring

Toshiba 2560 XDVD

A heavyweight notebook that sports desktop specs and impressive DVD capabilities.

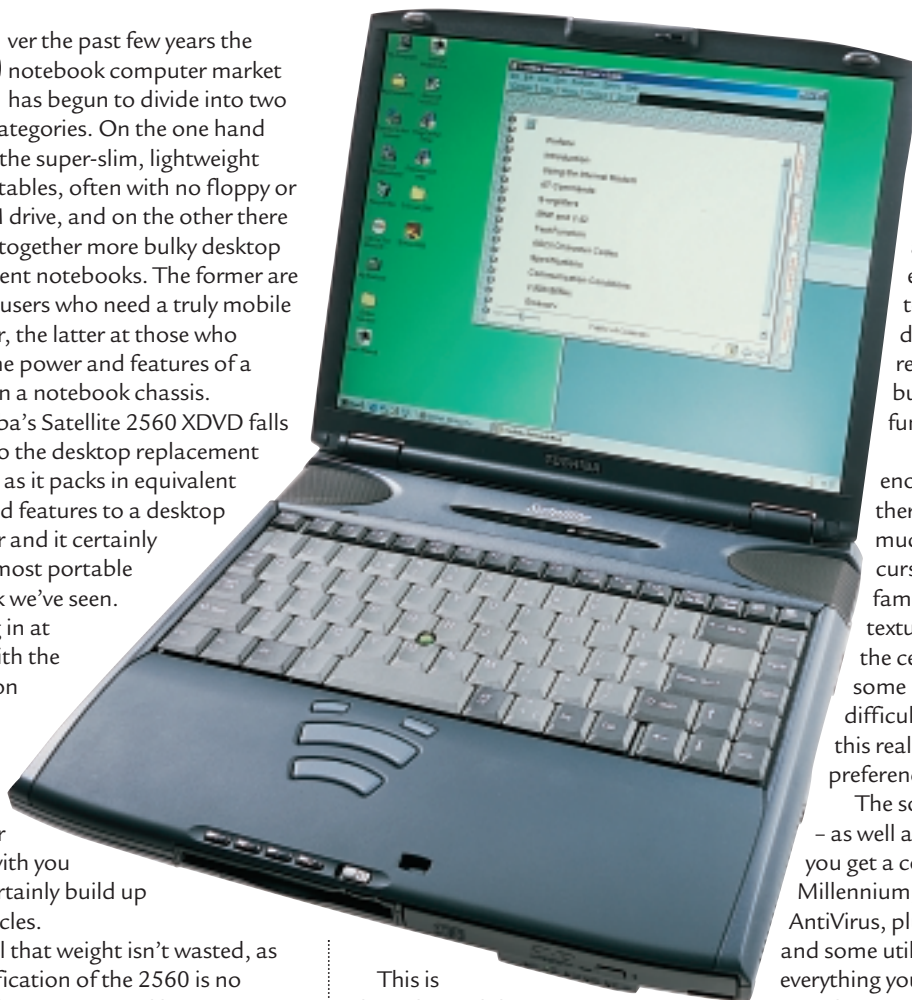
Over the past few years the notebook computer market has begun to divide into two distinct categories. On the one hand there are the super-slim, lightweight ultra-portables, often with no floppy or CD-ROM drive, and on the other there are the altogether more bulky desktop replacement notebooks. The former are aimed at users who need a truly mobile computer, the latter at those who require the power and features of a desktop in a notebook chassis.

Toshiba's Satellite 2560 XDVD falls firmly into the desktop replacement category, as it packs in equivalent power and features to a desktop computer and it certainly isn't the most portable notebook we've seen.

Weighing in at 3.16kg with the lithium-ion battery fitted, carrying this computer around with you would certainly build up your muscles.

But all that weight isn't wasted, as the specification of the 2560 is no lightweight. It is powered by a 466MHz Celeron processor, which wouldn't shame a low-end desktop computer. It has 64MB of RAM and a 6.4GB hard drive which, while not generous, is sufficient for most users. This line-up helped it to turn in a SYSmark score of 77. Graphics are provided by a 2.5MB Trident graphics chipset. This amount of video memory isn't much by today's standards, but it is ample for most business tasks.

The most notable feature this notebook has copied from the desktop realm is a quad-speed DVD-ROM drive, which comes with all the software you need to watch movies. On most other portable computers we've seen, the DVD drive is little more than a gimmick that pushes up the price, as a TFT display is not the ideal medium to watch movies, and often the lack of power in a notebook means playback is jerky with lots of lost frames.



This is where the Toshiba stands out from the crowd, its 14.1in screen may still not be the best display on which to view a film, but if you are on a plane or in a hotel it will do. When we put it to the test, playback was flawless, even in full-screen mode. When we moved the cursor around the screen there was no deterioration in quality, and sound from the built-in speakers wasn't too bad either, although we did find that we couldn't push up the volume very high using the external controls.

If you aren't happy with the quality of movies on the notebook screen, then there is also the option to hook it up to your TV. This feature means that as well as a fully-featured PC you get a DVD player, which is worth remembering when you look at the price tag.

Alongside the volume controls, there are also buttons to control audio CDs, although not DVDs, as well as a quick

access Internet button that takes you directly online. The selector buttons also have an unusual layout that we've never seen before. There are four – one each for left and right clicking, plus two extra buttons that are set up to allow you to scroll up and down. If you prefer you can reprogram the scrolling buttons to perform other functions instead.

The keyboard is pleasant enough to use, although there's no way to create much of a typing slope. The cursor is controlled by the familiar Toshiba trackpoint, a textured green nipple located in the centre of the keyboard – some people find these devices difficult to get along with, but this really is a matter of personal preference.

The software bundle is generous – as well as a software DVD player you get a copy of Lotus SmartSuite Millennium, Quicken 99 Basic, Norton AntiVirus, plus a couple of other titles and some utilities. This means you have everything you need to get started straight out of the box – another thing to consider when you look at the cost of the 2560.

URSULA TOLAINI

DETAILS

★★★★

PRICE £1,999 (£1,701.28 ex VAT)

CONTACT Toshiba 01932 828 828

www.toshiba.co.uk/computers

PROS Excellent DVD-playback quality, good performance

CONS Heavy, lack of video memory

OVERALL A good choice for a desktop replacement, it combines the features of a larger PC with top-quality DVD playback in a compact case

PERFORMANCE RESULTS

0 100 200 300 400



SYSmark 2000



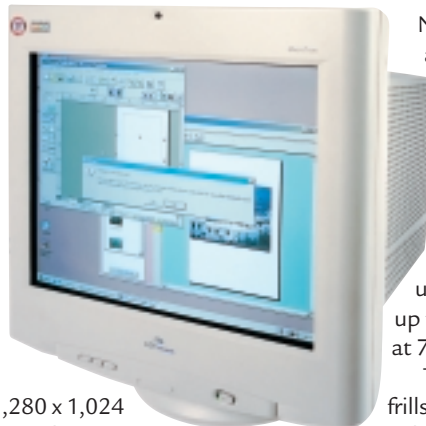
ADI MicroScan G910

A no-frills 19in flat-screen monitor with good resolution and great image quality.

The last of the big monitor suppliers to enter the world of flat-screen CRT monitors, ADI has launched the G910 to head up its range of Sony Trinitron FD-equipped displays.

The tube is a nominal 19in with an 18in viewable diagonal, so it should handle a resolution of 1,280 x 1,024 without any fuss. At this resolution, testing with a Matrox Millennium G400 graphics card, image quality is as good as we've come to expect from recent CRTs. Resolution is excellent, with stable electronics and vibrant colours from the aperture grille-based tube.

It is, however, less sharp than rivals equipped with Mitsubishi's Diamondtron



NF tube. There was also some noise on the image in our review sample. Taking the resolution up to 1,600 x 1,200 results in loss of definition, but it's usable. You can go up to 1,744 x 1,344 at 75Hz.

The 910 is a no-frills display: there's a single captive D-SUB video connector, and a gap in the base of the unit betrays the fact that a USB hub is an extra, costing £20 ex VAT. In the top of the screen bezel is a microphone, and a couple of screw-thread mountings at each side of the casing will accept optional speakers, too.

OSD controls are comprehensive,

with top and bottom extreme pincushion adjustments, plus vertical and horizontal linearity. In practice they weren't needed, with the unit delivering near perfect image geometry straight off the bat.

Overall, the G910 doesn't deliver anything ground-breaking, but it's a competent display for the money.

DAVID FEARON

DETAILS

★★★★★

PRICE £398.33 (£339 ex VAT)

CONTACT ADI 020 8327 1900

www.adimicroscan.com

PROS Great quality for a very reasonable price

CONS The tube isn't quite as sharp as Diamondtron NF variants, some signal noise

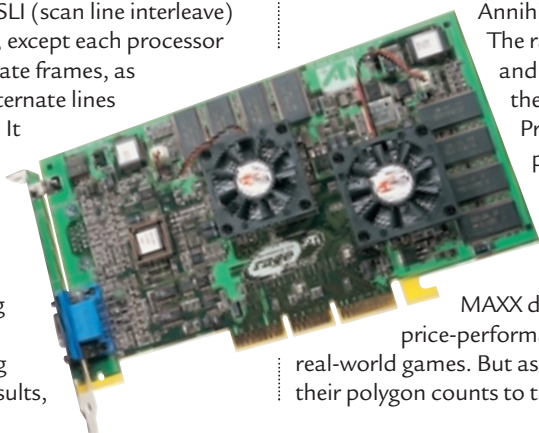
OVERALL The G910 isn't breathtaking, but it's a solid, good value display for those who need high resolutions

ATi Rage Fury MAXX

If you want a fast graphics card at a reasonable price this could be the one for you.

Unable to produce graphics silicon to catch up with nVidia's GeForce 256 and 3dfx's soon-to-be-unleashed Napalm graphics processors, ATi has come up with the Rage Fury MAXX. Like earlier Rage cards such as the Magnum, this features the Rage 128 Pro chipset, but there are two of them on-board, each with 32MB of SDRAM. The processors are employed in a fashion similar to 3dfx Voodoo 2s in SLI (scan line interleave) configuration, except each processor handles alternate frames, as opposed to alternate lines of each frame. It comes with ATi's DVD player software, but there's no accompanying TV output.

Comparing benchmark results,



the MAXX doesn't fare too well in 3DMark 2000. At 1,024 x 768 in 16bit colour it scored 2,598, as against the 4,574 of the Creative Annihilator Pro and the circa-4000 of both the Guillemot 3D Prophet and standard Annihilator. Switching to Quake III Arena gives a more encouraging performance: at 1,024 x 768 in 32bit colour it delivers 42fps in the standard timedemo 1 test, against the Annihilator Pro's 47fps and the Annihilator's 34fps.

The raw horsepower and bandwidth of the two Rage 128 Pros come into play when dealing with the high-quality 32bit textures. Currently, the

MAXX delivers the best price-performance ratio for real-world games. But as developers up their polygon counts to take advantage

of nVidia's hardware transform and lighting – which the ATi can't support – the MAXX is likely to fall behind. But as an extremely fast card for a reasonable price, the MAXX certainly delivers.

DAVID FEARON

DETAILS

★★★★★

PRICE £187 (£159 ex VAT)

CONTACT ATi 01628 533 115

www.ati.com

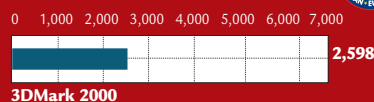
PROS Raw pixel-pushing power exceeds anything else at the price, 64MB memory

CONS No geometry processing capability

OVERALL If you need sheer speed but can't stretch to a DDR GeForce 256, buy a MAXX



PERFORMANCE RESULTS



Sony SDM-N50

With a supermodel figure and **the design wizardry only Sony can weave**, this monitor is magic.

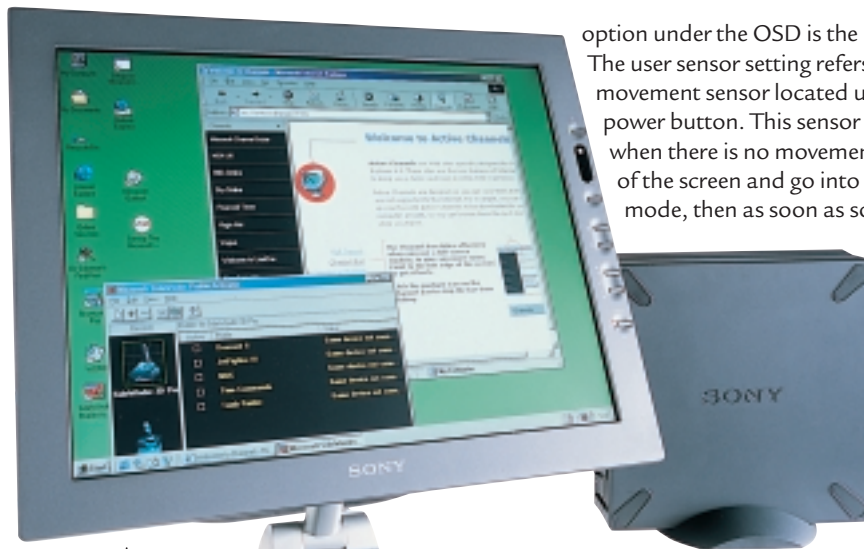
We've said it before and we'll say it again, no company can design products the way Sony can. Sony manages to take a product that's generally thought of as dull and turn it into a must-have item.

This time the magic design wand has been waved over a flat-panel monitor, and the results are nothing short of staggering. Without a doubt, the SDM-N50 is the most beautiful computer display ever constructed. That might seem like a strong statement, but you only have to take a look at this revolutionary monitor to see what we mean.

An average TFT display is about 9cm thick, but the SDM-N50 is an amazingly svelte 1.3cm thick. Not only is it thin, but it's easy to position, with the screen mounted on a multi-pivoted stand.

Breaking with the traditional beige plaguing most PC products, Sony has opted for a stylish grey and silver colour scheme, making its new baby even more of a style statement.

However, as thin and desirable as it is, what you see is not all you get. The SDM-N50 works in conjunction with what Sony calls the Media Engine. This square box of tricks sits between your PC and the screen. The Media Engine receives the power, video signal and sound and transmits it all to the screen



via a single cable. Of course, this means that the package isn't as small as you first think, but since the connection cable is two metres long it's easy for you to position the Media Engine out of the way and just have a single cable running to the screen. The Media Engine is capable of accepting two VGA inputs, which means you can connect two PCs to it and switch between them using the button on the screen fascia.

The adjustment controls are all located down the right-hand side of the display and the layout and usability is excellent. Without even entering the OSD you can adjust brightness, contrast and volume, and switch between input signals. Once you press the menu button you're presented with a comprehensive list of adjustments, including an ambient light sensor and a control to set the width of the stereo sound. However, the most impressive

option under the OSD is the user sensor. The user sensor setting refers to a small movement sensor located under the power button. This sensor will detect when there is no movement in front of the screen and go into power-save mode, then as soon as someone sits

in front of the screen it will switch on again. We know this is a gadget, but it's a good one.

The quality of the display itself is first rate. The colours are vibrant and the lighting is even across the surface. You also have the option of altering the backlight intensity under the OSD to suit your own preference. The optimal resolution of the display is 1,024 x 768, which is pretty standard for a 15in panel. There are stereo speakers mounted in the base of the stand, while a handy headphone socket nestles next to the main connection cable.

If you're considering buying an LCD flat panel because of the way they look, this is definitely the one to go for, but be prepared to pay a little extra for the privilege. If the extra expense doesn't put you off, you'll be buying the most beautiful and feature-packed LCD flat panel on the market.

RIYAD EMERAN

DETAILS

★★★★★

PRICE £1,173.82 (£999 ex VAT)

CONTACT Sony 0990 424 424

www.sony.co.uk

PROS Gorgeous, slim, feature-packed

CONS Relatively expensive

OVERALL The most stunning computer display ever to grace the offices of *PCW*. If you want a stylish desktop, then get one of these

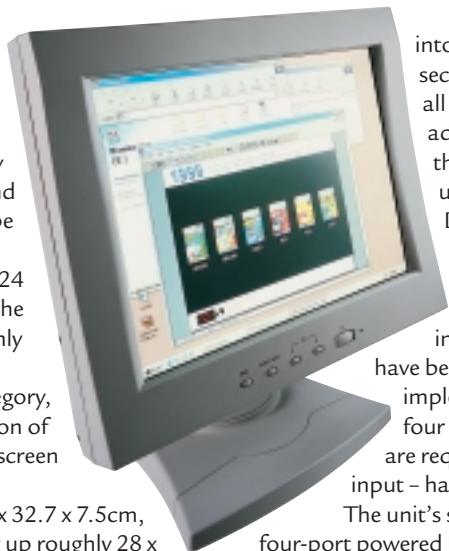


CTX Panoview PV751

This rotatable flat panel could make scrolling down long, thin web pages **a thing of the past.**

Flat panels are becoming increasingly common, and in a few years' time it is likely they will become the norm and CRT monitors will only be for those with big desks. Now that affordable 1,024 x 768 flat panels are on the market, this trend can only continue. The Panoview PV751 falls into this category, offering a native resolution of 1,024 x 768 on a 15.1in screen for £639 ex VAT.

The panel itself is 40 x 32.7 x 7.5cm, with the footprint taking up roughly 28 x 24cm of desktop real estate. The display is good, with uniform brightness and on our review unit there were no dead pixels. On the front bezel there are four menu keys and an off switch. The OSD is split



into three sections, covering all the necessary adjustments. At the rear of the unit you'll find a DC in and two D-SUB video connectors. The dual inputs could

have been better implemented, as four button presses are required to switch input – hardly ideal.

The unit's stand houses a four-port powered USB hub and the grandly titled Cable Management Device, or 'hole to put the cables through'.

The PV751 not only adjusts vertically and horizontally but can be rotated 90 degrees into a portrait position. To make

full use of this you'll need a copy of the Pivot software to electronically rotate the screen, otherwise you'll get neck ache.

Browsing the Internet or word processing naturally lend themselves to a longer thinner display, so it's just a shame the software isn't included as standard.

WILL HEAD

DETAILS

★★★★★

PRICE £750.83 (£639 ex VAT)

CONTACT CTX Europe 01923 810800

www.ctxeurope.com

PROS Very good product for the money, portrait facility

CONS Pivot software not included as standard, too many button presses to switch inputs

OVERALL Great value for money. It's a shame the Pivot software doesn't come as standard, but then maybe not everybody wants it



Toshiba SD-R1002

The best of both **CD and DVD** worlds.

The SD-R1002, more affectionately known as the Combo, is not only a CD-RW drive, but also a DVD-ROM in the same unit. Using an advanced, high-performance pick-up head that incorporates two laser diodes, it can read DVD and read and write a full 650MB CD-R or CD-RW in under 20 minutes. With a 2MB buffer, this should happen glitch-free. In terms of DVD-read speed, the Combo is billed as a four-speed, but in our tests it achieved 4.9. The full retail kit aims to provide a complete solution, and to this end everything you need to install and use the Combo is included. Cables, screws, a manual eject pin, CD-R and CD-RW media and even a CD-labelling pen.

Also included is an equally comprehensive software bundle. CD-writing software presents itself in the form of the competent VOB Instant CD. InterVideo WinDVD 2000 provides



software DVD decoding and, provided your PC is equipped with at least a Pentium II 350MHz processor, you can expect smooth movie playback. Other bonus software comprises the excellent VOB InstantMusic, with which you can create CD-quality tunes, and MusicMatch audio player, an easy-to-use CD and MP3 encoder and player. Other benefits of a combination drive are that it only takes up a single bay and EIDE connector, and installation is a doddle.

The results from our CD Tach benchmark showed a read rate of 15.7-speed, the average across the disc – not a bad result from a 24-speed rated

drive. Amazingly, the random access time came out as 83ms, which is actually faster than Toshiba's claim of 110ms.

On average the DVD read was 3.2-speed – a little bit slower than we would have liked to have seen, but it's still fine for most of today's applications.

JIM MARTIN

DETAILS

★★★★★

PRICE £246 (£209.36 ex VAT)

CONTACT Toshiba 01932 828 828

www.toshiba.co.uk

PROS Easy to install, generous bundle

CONS A touch on the slow side

OVERALL The Combo is a long overdue product, so all credit to Toshiba for getting there first. Its performance isn't quite brilliant, but it's certainly up to the jobs that it was made for

Sony Mavica MVC-FD88

A floppy disk-based camera.

When your medium of choice is a floppy disk, you can't expect to buy a pocket-sized camera. That said, the FD88 is not overly heavy, and it does benefit from an inexhaustible supply of cheap media – the cost of ownership is far lower than that of CompactFlash or SmartMedia cameras. It's also highly versatile. The lens can be supplemented by a range of filters and external lenses to achieve the right result. It has an 8x zoom, upped to 16x when the digital zoom function is invoked.

It sports a 1.3 megapixel CCD for non-interpolated images at 1,280 x 960 resolution. The colours it produced were sharp and realistic. Even full-sized images using the 'fine' setting had only minimal noise and could put competitors' efforts to shame. In tests, a 1.44MB floppy held four 1,280 x 960 images at this setting, rising to 25 VGA snaps using the 'standard' setting. These are written to disk as quickly as some CompactFlash cameras, thanks to the new quad-speed drive. The only downside is that it's a bit noisy, but not unbearable. At the same time, it writes a small HTML file of hyperlinks to your images for use in a browser.

Full-sized images had only minimal noise and could put competitors' efforts to shame

There is no optical viewfinder, so you'll have to rely on the 2.5in LCD. We found this to have conservative power drain, as a single charge of the battery lasted us a couple of days. Sony estimates it should have enough stamina to last around two hours or for 1,200 shots. This is no doubt thanks to the 'Solar Window', a thin clear window that lets you use natural light rather than the backlight to illuminate your images. The Infolithium battery displays remaining usage time in the corner of the LCD.

The FD88 is also capable of MPEG1 recording. In our tests, it squeezed one minute three seconds at 160 x 112 resolution, dropping to 15 seconds when the resolution was increased to 320 x 240. The camera simultaneously records

sound, and as it can be set to record in five, 10 or 15-second blocks it doesn't matter if your finger slips off the shutter button during the process. A supplied AV cable will send recorded images and sound to an NTSC or PAL television.

There are a number of obvious advantages to using a floppy disk as the

recording medium. First, it requires no drivers, which makes it truly cross-platform, although if you're using it with an iMac you'll have to have an external drive. It is also ideal for beginners – just take it out of the box and away you go. No fiddling with downloads. There are also no cables, so it puts an end to clambering around behind your PC.

There are a few missed opportunities. The FD88 obviously has some internal memory, as it can copy disks or cache a 60-second MPEG file before writing it to disk, but there is no way of using this for storing images before writing to disk. If there was, you could have much shorter response times between consecutive photos. It's a shame, too, that there isn't a version using Sony's 200MB HiFD

floppy format with a bundled drive – it would push up the price, but it would also make this camera hard to beat in the sub-professional arena.

The Mavica is ideal for first-time users, but as many are now buying iMacs for their ease of use, it's a shame it doesn't include some way of getting your images into the fruity wonder without the need to invest in a floppy drive, especially as the packaging boasts Mac compatibility. Exposure and flash can all be handled by the camera, making it easy to get the pictures you want with little effort.

NIK RAWLINSON



DETAILS

★★★★

PRICE £700 (£595.74 ex VAT)

CONTACT Sony 0990 424 424

www.sony.co.uk

PROS Cheap to run, conservative power drain, MPEG encoding, good image quality, good choice for beginners

CONS A couple of enhancements could have earned it a five-star rating

OVERALL A sensible choice for the less experienced user but it also has plenty to offer old hands

Handspring Visor Deluxe

At last, a handheld with **enough tricks up its sleeve** to really give the Palms a run for their money.

Despite the efforts of Microsoft to convince us otherwise, if you want really small, yet functional organisers, there's only one game in town – 3Com's Palm series. The company has a huge chunk of the market and there's a wide range of software that you can run on it, ranging from games to business applications.

The Handspring Visor is one of the first products to appear as a result of the licensing of the Palm OS by 3Com. Handspring itself was set up by the original creators of the Palm, so it has been a long-awaited product. But has the wait been worth it?

The Visor Deluxe looks pretty similar to a 3Com Palm IIIe, and it sports much the same features, although with 8MB of memory, compared to the 2MB on the similarly priced 3Com device. You can have it in graphite or, if you prefer, in a choice of four translucent colours.

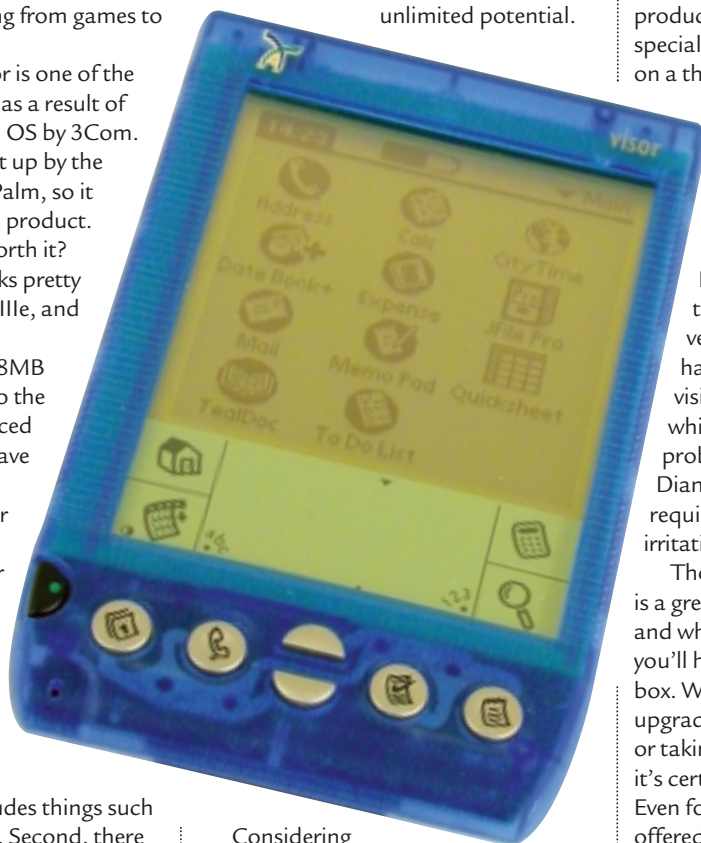
There are some other important differences, too. First, there's no built-in flash memory. That means that you can't upgrade from PalmOS 3.1H – although Handspring's customised version includes things such as Euro support anyway. Second, there are some differences in the applications. Handspring has added a better date book that will display ToDo items, and a world clock.

All this is small beer, however, compared to the really big changes. First, the Visor connects via USB. Anyone who has waited for lots of contacts to synchronise will appreciate the extra speed this gives you. Both Mac and PC software is included; as long as you have a USB port, you don't need to buy anything else. A serial cradle is available as an option if you don't have USB.

Important change number two is the Springboard. It's an expansion slot on the rear of the Visor covered by a plastic shield. Pop off the cover and slip in a Springboard module, and you have true Plug and Play – the modules include their own software and drivers. A flash memory

backup module, a Tiger Woods golf game and a modem are already available.

Other modules planned – from both Handspring and other vendors – include GPS receivers, pagers, and MP3 players. Just drop in a module and your Visor turns into a PDA with virtually unlimited potential.



Considering that it costs around the same as the Palm III, yet packs in so many more features, it's really no surprise that Handspring has been working very hard to keep up with the demand for the Visor.

It's not all sweetness and light, however. There are some things that may annoy or upset die-hard Palm supporters. Starting with one of the most trivial, the infrared port is on the side, instead of the end; it has to be like that, otherwise it could potentially be covered by some of the larger Springboard modules. But it means that if you want to use remote control software, you might find yourself having to hold the Visor at an odd angle.

More seriously, for those who have accumulated gadgets and gizmos, the port on the bottom of the Visor is not

compatible with either Palm III or Palm V models. Therefore, if you've bought a portable keyboard, or something like TDK's Global Pulse software and cable to link to your mobile phone, then you won't be able to use them with the Visor. However, given time, some of these products will be made compatible, with special Visor versions, but if you do rely on a third-party tool such as this, it's worth checking before you make the switch.

Another problem that we read about online and experienced with one program is software incompatibility. Frankly, the list of applications that actually have had problems is very small – and in many cases it has since been fixed, but it's worth visiting the VisorCentral website, which lists updates and known problems. One application – the Dianameter – locked up the Visor, requiring a reset. No data lost, but irritating nevertheless.

Those niggles aside, the Visor Deluxe is a great piece of kit. It feels well built, and whether you're a PC or Mac user, you'll have everything you need in the box. Whether you're considering upgrading from a 3Com Palm product, or taking the plunge with your first PDA, it's certainly worth a very serious look. Even forgetting about the flexibility offered by the Springboard slot, or the faster USB synchronisation, it's more than competition for the Palm III in value for money terms. Pricing is currently set in US dollars.

NIGEL WHITFIELD

DETAILS

★★★★★

PRICE \$249 (approx £155)

CONTACT Handspring 00 1 888 565 9393

www.handspring.com

PROS Great value for money. Lots of potential for expansion

CONS No flash memory for OS upgrades, some older Palm software may have compatibility problems

OVERALL A very worthy competitor to the 3Com products, the expansion slot promises to make it much more than a PDA

Adaptec 29160

An Ultra160 SCSI card boasting a bandwidth of prairie-like proportions and unique compatibility.

Ultra160 SCSI marks an improvement for SCSI in two ways. First, it doubles the currently available channel bandwidth to a massive 160Mbytes/sec, and second, it's the first time that a new standard has been made that actually makes sense when compared to its bandwidth.

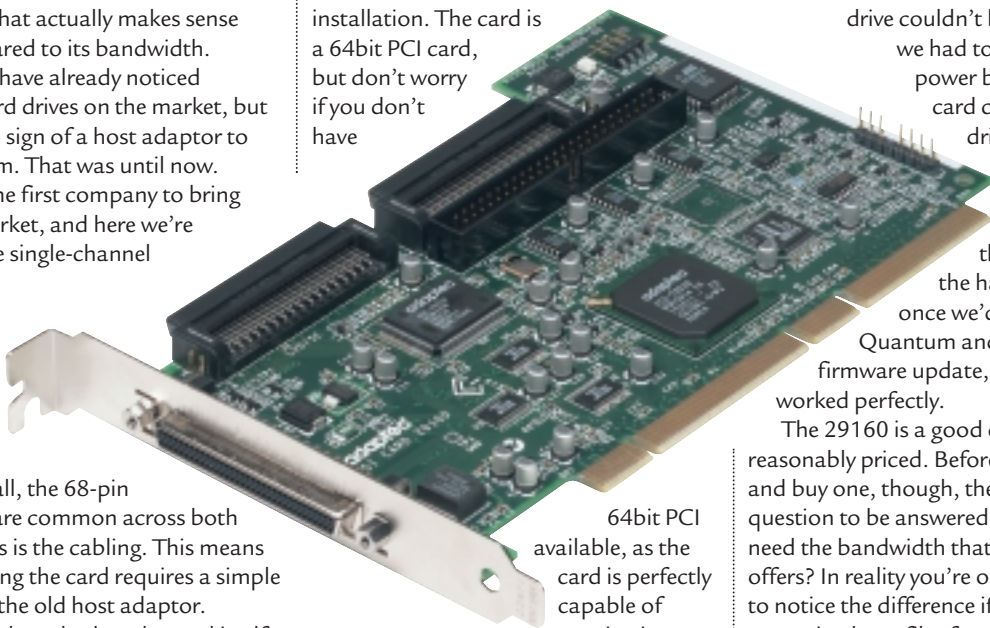
You may have already noticed Ultra160 hard drives on the market, but there was no sign of a host adaptor to use with them. That was until now. Adaptec is the first company to bring a card to market, and here we're reviewing the single-channel 29160.

On first appearance the card looks much like an Ultra2 LVD card – after all, the 68-pin connectors are common across both standards, as is the cabling. This means that upgrading the card requires a simple swap out of the old host adaptor.

Taking a closer look at the card itself we noticed a small anomaly. There were two 68-pin internal connectors on the card, but wasn't this supposed to be a

internal 68-pin connector and the internal 50-pin connector. As far as we're aware, this feature is unique to Adaptec and means that one card will suit all devices.

Next came the installation. The card is a 64bit PCI card, but don't worry if you don't have



32bit slot instead, just in a slower 32bit mode. We decided that, as we had the option to plug it into a server with 64bit

64bit PCI available, as the card is perfectly capable of running in a

perfectly at home inside a Windows 9x machine. However, once we rebooted we noticed a problem with one Ultra 160 hard drive – a Quantum Atlas IV. The SCSI BIOS picked it up on boot, but once we were in Windows NT the

drive couldn't be seen. In fact,

we had to recycle the power before the SCSI card could see the

drive again. To

be fair to

Adaptec, the

fault lay with

the firmware on

the hard drive, and

once we'd contacted

Quantum and got the latest

firmware update, the drive

worked perfectly.

The 29160 is a good card and it is reasonably priced. Before you go out and buy one, though, there's one question to be answered: do you really need the bandwidth that Ultra160 offers? In reality you're only ever going to notice the difference if you are streaming large files from multiple drives. If this isn't the case, and you don't have a lot of drives hanging off a single channel, then you may well be better off sticking with the card you have, as no hard drive can read data as quick as the available bandwidth on an Ultra160 channel.

On the other hand, if you need a SCSI card, then you may as well get the best you can, and this card is exactly that. Just don't be fooled into thinking that the performance of your computer will suddenly double.

DAVID LUDLOW

If you need a SCSI card, you may as well get the best, and this card is exactly that

single-channel card? Opening the manual gave us the answer.

The additional connector is for compatibility reasons. If you want to run Low Voltage Differential (LVD) devices (Ultra2, or Ultra160) at speeds greater than 40Mbytes/sec then these are the only devices that you can have attached to a channel. Adaptec has got around this through its SpeedFlex technology.

This basically means that two connectors are included for the channel, and electronically isolated, into primary and secondary segments. All LVD devices connect to the primary segment – on this card the first internal, and the external 68-pin connector – and other devices connect to the secondary segment – for this card it's the second

PCI, it would be a shame to pass it up.

From this point on the card acts just like any other Adaptec card that you may have seen. During the Power On Self Test (POST) the card displays any devices to which it is connected, and allows the user to enter the SCSI BIOS. The BIOS allowed us to change the boot priority of the card – after all, if you have two SCSI cards in your computer, you may not want to boot off this one. Also included as part of the BIOS are some tools to deal with hard drives, such as checking the disk media, and performing a low-level format.

Proceeding with the installation we booted into Windows NT and installed the drivers through the Windows Control Panel. We used NT, but the card is

DETAILS

★★★★

PRICE £259.99 (£221.27 ex VAT)

CONTACT Adaptec 01276 854500

www.adaptec-europe.com

PROS Well engineered, the fastest SCSI card available

CONS Some compatibility problems with older hardware

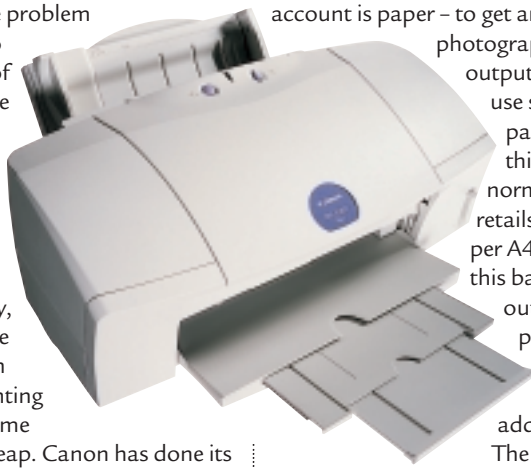
OVERALL Adaptec's usual quality for a SCSI card, although the additional bandwidth may be wasted on a lot of systems

Canon BJC-8200Photo

This printer may help solve the cost problem of getting photos **off the desktop and into the album.**

Digital photography is fast becoming the most popular way to capture images for posterity, but the problem it poses is how to get a hard copy of your pictures. The most convenient solution lies in a photo printer such as Canon's BJC-8200-Photo.

Unfortunately, it isn't that simple and you will soon discover that printing out photos at home doesn't come cheap. Canon has done its best to cut down on wastage by storing the six inks used by the BJC-8200Photo in separate tanks within the print head, so you don't have to replace the whole lot when one runs out. But at £10.56 per



tank, if you do a lot of colour printing these still work out pretty dear.

The other cost you have to take into account is paper – to get anywhere near photographic quality output you have to use special glossy paper, which is thicker than normal, and this retails at around £1 per A4 sheet. On this basis, printing out 24 6 x 4in pictures will set you back £8, without adding ink costs. The other drawback with photo-quality printing is speed, as it is a slow business. However, we managed to print out 0.7ppm, which is faster than Canon's claimed 0.31ppm. Obviously

print speeds rise if you decrease quality, so you can churn out pages at over 2ppm for draft text or colour.

Output quality on photo paper was impressive, with realistic skin tones that are notoriously tricky for printers to reproduce. Our only complaint was that some colours looked a bit washed out.

URSULA TOLAINI

DETAILS

★★★★

PRICE £351 (£298.72 ex VAT)

CONTACT Canon 0121 680 8062

www.canon.co.uk

PROS Individual ink tanks cut down on wastage; good quality photo output

CONS Slightly washed-out colours, expensive consumables

OVERALL A better than average photo printer. If you feed it high-quality paper you get high-quality output back

Canon BJC-85

A mobile printer that **breaks the tradition** of rough and ready output quality while on the move.

The market for portable printers may be small, but if you really can't do without a printer when you are on the move, Canon's new model is designed to offer mobile, high-quality colour printing.



The printer comes with both parallel and USB connections, plus drivers for Mac and PC, making it one of the few options for Apple users who need a portable printer. It also has an IrDA port and Windows CE drivers so you can print from a PDA, too.

Print quality is usually something you have to sacrifice if you need to print while on the road, and if you use standard paper the BJC-85 does nothing to buck this trend. Text printing is fine, but on colour graphics the black ink ran into the coloured blocks in our test print and graphics suffered from banding.

If you're prepared to pay for Canon's special paper – £6 for 50 sheets and you can only print on one side – output is excellent. Images are pin-sharp at the 760 x 360dpi maximum resolution, the best we have seen from a portable printer and speed isn't bad at 2.8ppm for text.

At 1.4kg this isn't the lightest

portable printer you can find; Brother's MP-21C is lighter at 1kg. And while Brother's unit draws power from your notebook's battery, the BJC-85 needs an external power source – either the supplied AC adaptor or an external battery for £80 extra.

URSULA TOLAINI

DETAILS

★★★

PRICE £257 (£218.72 ex VAT)

CONTACT Canon 0121 680 8062

www.canon.co.uk

PROS High-quality printing on special paper, range of connection options

CONS External power supply necessary, printing costs

OVERALL If you have to have top-quality output when you are on the move, and you have the budget to cover the cost of consumables, the BJC-85 could be for you

HP LaserJet 3150

If you've ever wished for just one bidge box to meet **all your office requirements** – well it's arrived.

Externally, the 3150 looks just like any other fax machine. Paper is stored in an upright feed at the rear, while the output bin is located at the front. A numeric keypad and LCD display dominate the control panel, allowing faxes to be sent. In fact you could just leave it at this and use the 3150 as a standalone fax machine.

However, to take full advantage of its functions, you're going to want to get the device connected to your PC. The 3150 has a parallel port connection on the rear. HP uses a proprietary port design, so we were glad to see that it provides a suitable parallel cable as part of the bundle.

Our Windows 98 machine detected the new LaserJet at boot and prompted us to insert the driver CD. This not only gets the drivers installed, but also loads the JetSuite software. This is used to control the operation of the 3150 and perform some basic setup tasks. In our case this meant setting the correct time and date. While this operation can be done through the unit's hardware

sheet-fed, you are limited to scanning documents that will fit through the device mechanism. Its 300dpi optical resolution (600dpi with



interpolation) makes it suitable for OCR use, although as it's purely mono, you'll only get greyscale output.

For the fax, the LaserJet 3150 has a print to fax option, enabling you to fax any document from Windows-based applications. This option also allows the user to define an address book with

faithfully, and remained a solid black colour. Graphics, on the other hand, were acceptable but nothing special. Our greyscale picture showed that the LaserJet 3150 had some trouble representing the variance of shades that the picture required for accurate representation. Some banding crept into the output, but the main points of the picture were still recognisable.

HP quotes a print speed of 6ppm. To check this out, we took averages after timing the printing of a 50-page single-font Word document, and a 50-page Adobe Acrobat file,

combining graphics and text, and our results matched HP's boast.

The LaserJet 3150 is better than a lot of multi-function devices we have seen. It integrates well with the PC environment, providing the control software you need to get full functionality out of the device. The LaserJet lends itself well to being used as the only office printer, as the text quality is superb. We can forgive the graphics output, as this kind of printer wasn't designed to reproduce photo-quality images, and the greyscale output is fine for the occasional diagram. The scanner can't rival a dedicated flatbed scanner, after all it's sheet fed and only produces mono output. However, for scanning in the odd text document for OCR, or sending a fax, it'll do fine.

DAVID LUDLOW

Text quality was impressive. Even the smallest-sized text was reproduced faithfully

control panel we found it easier to change just a couple of dialog boxes through software.

While JetSuite will give you access to the fax, scan, and print options, we found that this wasn't necessarily the best way to work. The LaserJet 3150 installs a TWAIN driver, giving access to its scanner, meaning that packages such as PaintShop Pro can address it directly. The main problem we found with the whole setup is that, as the scanner is

minimum effort. The only problem we encountered came when we wanted to pick a cover page, as the driver doesn't allow you to see which sheet you are choosing. This option is only available inside the JetSuite application, as is the option to design your own cover sheets.

We used a series of tests to check the quality of both graphics, and text, and also to look at the speed of the print engine. Text-quality was impressive. Even the smallest-sized text was reproduced

DETAILS

★★★★

PRICE £581.63 (£495 ex VAT)

CONTACT Hewlett-Packard 0990 474 747

www.hp.com

PROS Good print quality; good integration with the PC

CONS Print to fax option could make cover sheet selection easier

OVERALL A worthy multi-function device that provides all the options for standard office use

Dreamweaver & Fireworks

The third versions of these packages work in sync like **Fred and Ginger**, making history together.

When Macromedia sends pre-release software to the press, it makes sure that it waits until the very last moment. In this way, previews can be expected to represent the finished product fairly closely, save for a little last-minute tweaking. That is as true in this case as any other, and so the final versions of both Dreamweaver 3, the web-authoring package, and Fireworks 3, the image-optimisation tool, are very similar to their beta predecessors.

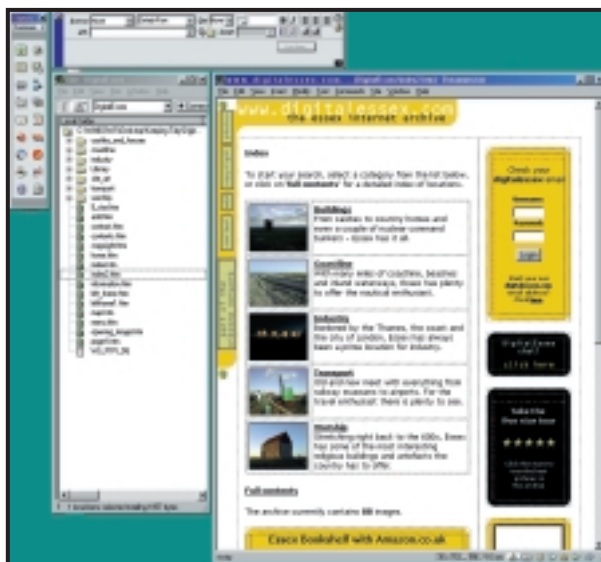
The one thing at which no other package is able to beat Dreamweaver is table creation. Some users may initially prefer the graphical-drag method that mimics the version found in Microsoft Word, but Dreamweaver's simple on-screen form ensures that every parameter is in place from the word go. Manipulating the table from that point on is a simple matter of highlighting the appropriate cells, right clicking and selecting an action from the table menu. You never encounter an unexpected action, which may be a refreshing change if you have switched to Dreamweaver from another package.

If you are trying to decide whether or not it is worth upgrading to either of these packages from version 2, then the answer is a resounding 'yes'. The History palette alone makes an upgrade

The History palette keeps a list that can be rolled back, even back through saves

worthwhile. This tracks your every action, keeping a list that can be rolled back, even back through saves. This allows you to try out designs and even save them for viewing within a framed environment – which is not possible using a standard preview – and then undo any damage. A secondary History function is that it allows you to save the contents of the palette as a macro. Therefore, if you always perform the same set of functions to create a menu imagemap at the top of a page, for example, you can simply load them as a macro and cut out the repetitive work.

We reported in our preview that the



Dreamweaver: Easy to use, but it benefits from a large monitor

parameter adjustment bars in Fireworks had switched from their original vertical orientation to horizontal. This required the user to release their mouse click, reposition and then drag the slider from left to right. Fortunately, this has now reverted to the original vertical position, which offers far smoother operation.

Fireworks will also neatly trim text-box boundaries, eliminating unnecessary overlaps and making it easier to select image elements.

The only complaint we have with the suite as a whole is Dreamweaver's FTP functions, which at times can seem a little flaky. Working on a LAN with a permanent Internet connection, it was great to be able to simply click 'put' from the site files map and know that Dreamweaver would take care of logging on to the remote server and depositing the file in the correct sub-directory, but when transferring multiple files over a modem, we found it easier to use an external FTP package. A nice touch, though, is the option to upload all referenced files, so if your page includes a number of images, they will be

transferred, too. It's probably best not to set this as the default option – if you're working on an evolving site and uploading pages as they are completed, you'll also find yourself uploading your regular page furniture each time.

If you can't afford both packages then we'd recommend that you opt for Dreamweaver 3. However, the two are so well integrated – right-clicking on an image within Dreamweaver will

bring up the option to edit it in Fireworks 3 – that most users would benefit from investment in the studio combo-package.

NIK RAWLINSON

DETAILS

★★★★★



PRICE Dreamweaver 3 £269.08 (£229 ex VAT) or upgrade for £116.33 (£99 ex VAT); Fireworks 3 £163.33 (£139 ex VAT) or upgrade for £116.33 (£99 ex VAT); Dreamweaver 3 Fireworks 3 Studio combo £351.33 (£299 ex VAT) or upgrade from both Dreamweaver 2 AND Fireworks 2 to Studio for £175.08 (£149 ex VAT) or upgrade from either Dreamweaver 2 OR Fireworks 2 to Studio for £210.33 (£179 ex VAT)

CONTACT Computers Unlimited
020 8358 5857 www.macromedia.com

SYSTEM REQUIREMENTS

Dreamweaver 3: Windows 9x/NT4, 120MHz or faster processor, 32MB of RAM, 20MB free hard-drive space, 256-colour monitor with a resolution of 800 x 600, CD ROM drive

Fireworks 3: Windows 9x/NT4 with Service Pack 3, 64MB of RAM, 640 x 480 display with 256 colours, 100MB free hard-drive space, Adobe Type Manager 4 or later with Type 1 fonts

PROS Excellent History function, good interaction between packages

CONS FTP a little quirky

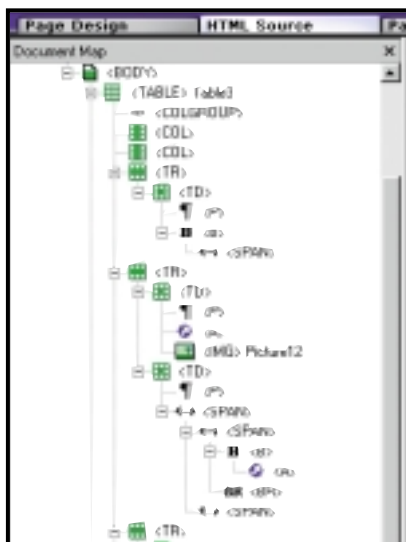
OVERALL Still the best web combo around

NetObjects Fusion 5

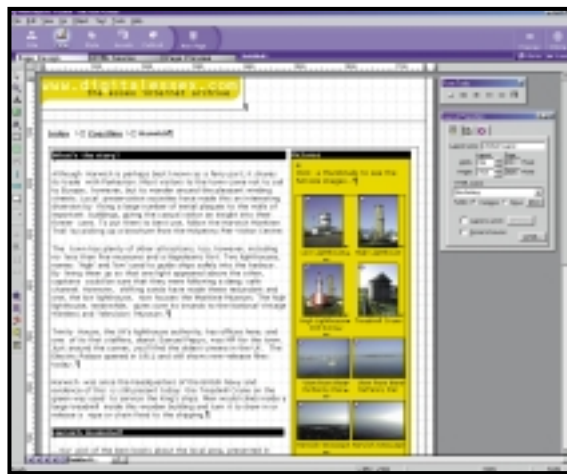
A competent web-authoring tool with a talent for self-publicity, that is suited to **business users**.

Code-named Monaco, this is the latest incarnation of the highly successful Fusion web authoring tool. More popular with business users than home web authors, its border-and-page approach makes it easy to quickly create and update a set of uniform pages, although because of this, more creative users may find it slower to use than the likes of Macromedia Dreamweaver or Microsoft FrontPage.

Users of Fusion 4 will recognise the clean interface. In this version it has been slightly enhanced to give it a more rounded, 3D look, but you'll find many of the old functions in their original locations. However, at times we found the package cumbersome. Switching from the page-design view to the raw HTML source mode should be instantaneous, but this relatively simple procedure in Fusion 5 took so long that it made us wonder if our test machine had crashed. Once switched, however, the mode offers a number of innovative features that, when you get used to using them, will probably turn out to be something you cannot do without. First, there is a Document Map. This looks like the familiar Windows Explorer, in that tags are presented in a hierarchy with



Fusion's Document Map allows the site's structure to be changed on-the-fly



Fusion's page layout view has a clean interface, and has been slightly enhanced to give it a more rounded, 3D look

embedded tags inset on small branches. Used in conjunction with the HTML code itself, this makes navigating the page quick and easy.

The source code is presented in sections. Fusion separates out the individual sections of the page into shaded boxes, so a long paragraph, for example, will be in a box of its own. This can often be collapsed, so that you can see more of the tags at once without being distracted by the content. To help you remember what it is that the collapsed sections contain, the last line of the previous section will contain an opening tag, and the first line of the following section a closing tag, giving you a clear indication of the contents.

Pages in the site structure view are colour-coded, so that you can immediately see which child pages are linked to a common mother page, without having to follow the directory tree back to the source. By simply clicking and dragging on one of these pages you can easily reorder your site and all links will be automatically updated, which is a real time-saver, especially considering this can even be done with completed pages, so there is no need to open them and recode.

Fusion works on a whole-site basis, so even if you have not finished your design you can see that your links are working. It also means that when you close the site and everything is compacted into a neat directory you can

be sure that you won't accidentally delete an individual file and break your navigation. One thing we didn't like was the way that it added a NetObjects Fusion logo to every page it creates. This can be deleted, but we thought it somewhat cheeky – a word processor doesn't stamp an advert for itself on every page!

The polygon drawing tool is a useful feature that other software houses would do well to emulate. This allows you to draw directly onto your page. Once complete, the polygon is saved as a GIF file that is then referenced from within the HTML. Inserting a table is also simple – just define where it should sit and then how

many columns and rows it contains. However, if you specify the table should have no borders they even disappear within the page design mode, which can make placing the cell contents fiddly.

Form designing is well thought out. When you specify a form area you are automatically given the option to create the form within a table. As many users opt for this to produce a neater layout, it is good thinking by NetObjects.

Fusion 5 will appeal to business users and those who need to maintain a strict house style. Its use of styles and a site map that allows restructuring on-the-fly set it aside from the crowd, but it might be less suitable for smaller-scale users.

NIK RAWLINSON

DETAILS

★★★★

PRICE £240.88 (£205 ex VAT)

CONTACT NetObjects 0800 029 9851

www.netobjects.co.uk

SYSTEM REQUIREMENTS 133MHz processor, Windows 9x/NT4, 50MB free hard-drive space, 32MB of RAM, 800 x 600 resolution display with 256 colours

PROS Excellent site map features, quickly implemented 'styles'

CONS Stamping NetObjects logo on pages, sometimes cumbersome

OVERALL A good choice for large businesses, but there are more suitable alternatives for those working on a smaller scale

Novell NetWare 5.1

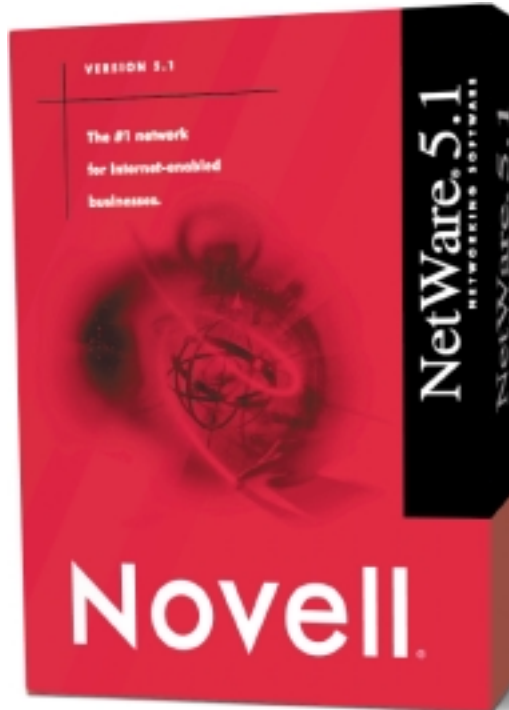
All the functionality of the previous incarnations, plus some added extras to help with ecommerce.

Novell has a well-earned reputation for making reliable products. This is built on the fact that NetWare servers are superb at file and print sharing. In fact, there are still people out there running NetWare 3.12 on 386 machines without any trouble at all. All of this has left Novell in a situation where it is difficult for the company to reposition itself for today's market, something that NetWare 5.1 is ready to achieve. With ebusiness starting to make a big impact on all kinds of markets, the infrastructure to support the front end is a lucrative business, and this is where Novell is hoping to move in with 5.1.

Essentially, this new release is simply NetWare 5, bundled with additional products for information sharing, such as FTP and the web.

Taking a look at the specifications, we decided to install our review product on an Intel 733MHz, 820-based machine. NetWare 5.1 requires a higher-specced machine than you may be used to. For a standard install of the operating system, Novell recommends 128MB of RAM to get you started. If you decide to use the application server, you're looking at 512MB instead. But before we knock Novell for requiring large amounts of RAM, let's just think how much a Windows NT Server would need to perform a similar job – around 1GB.

Our installation began in the same



Giving up the 820 machine as a lost cause, we moved over onto a more traditional Pentium II machine and began the install process from there. This time we were successful as the network card was automatically detected. We could now continue to the Novell Directory Services (NDS) part of the install.

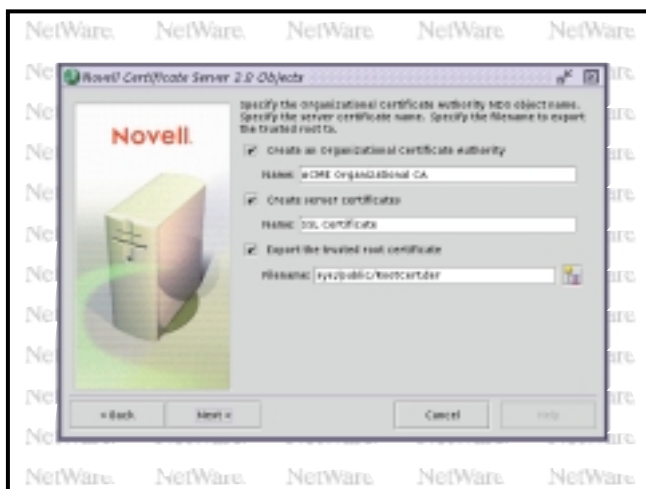
If you're not familiar with NDS then you don't know what you're missing. NDS is what makes NetWare a dream to manage. It's best to think of it as a central database where all administration tasks are stored. All users are stored in NDS, as are other objects such as servers. This database then acts as a single point of administration, so jobs such as moving users from one group to another is an easy task. A similar operation in NT – moving a user between domains – requires a visit to two separate machines.

As NDS is so important to NetWare, the installation of a server requires that the machine is registered with NDS. While those familiar with NDS may think that the screens to do this look exactly the same as for NetWare 5, there is a subtle difference. The back end to NDS has been replaced with NDS 8, or edirectory. This is an updated version of NDS that allows more objects – users, printers, servers – to be stored inside, and searching through this data is also quicker. NDS 8 therefore provides the backbone for storing the additional information required when creating an ebusiness site. As we were installing a single server, we decided to create a brand new tree to put it into, but we could just as easily have put it into an existing tree.

The next stage of the installation process showed the first signs of something new, this time through the licensing scheme. In addition to needing a licence for the user part of the software, another licence is needed for cryptography. Parts of NetWare 5.1 require that secure connections can be made to the server, through technology such as SSL. Both licences should be provided on discs when you buy the

way as any other NetWare server, by creating a DOS partition from which the server would boot, and then running the install procedure from the setup CD. This took us to the familiar hardware detection screens. Unfortunately, we ran into a problem almost immediately when the software tried to detect our network card, with the installer reporting that it couldn't find one. We tried to pick the card manually from a list, but this just resulted in crashing the machine. Deciding that it might be a driver

problem, we logged onto the Internet and downloaded the latest drivers for our card. Trying the installation again, however, just caused the machine to crash in the same way. We couldn't skip the network card installation, as NetWare requires one to be installed in order to work.



Prepping the server to provide secure connections

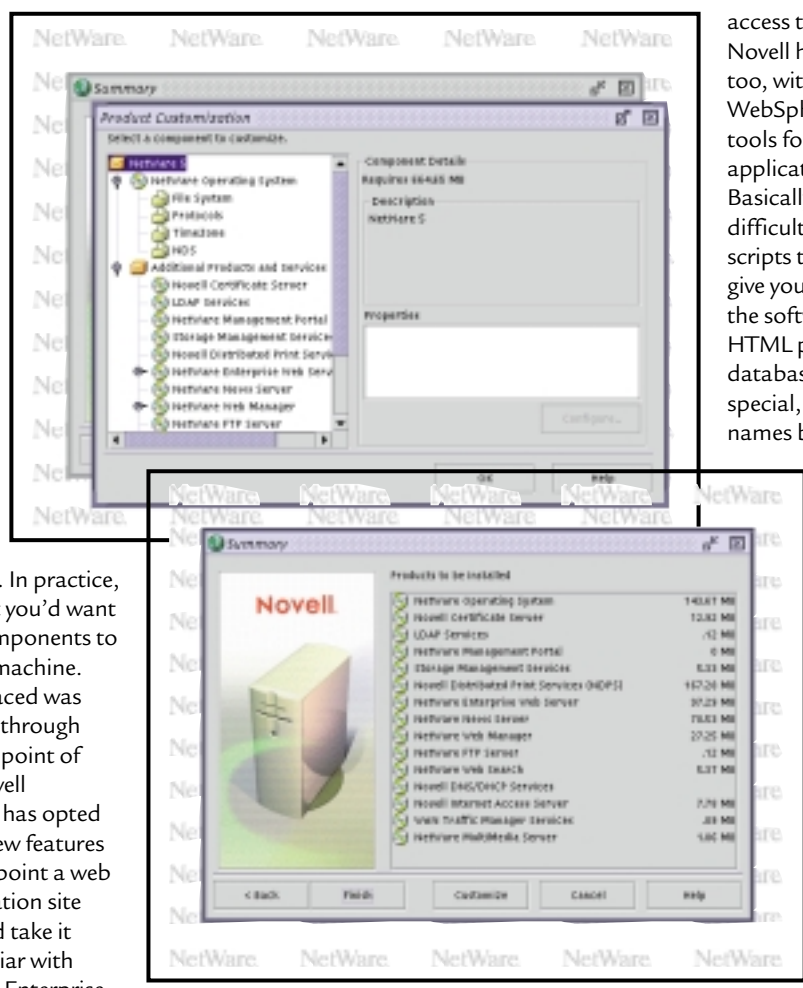
package. From this point onwards installation is just a matter of picking which packages you want to install, and a few options associated with each. Installing the web server, for example, allows you to choose which IP port administration will work on.

Once we had the server up and running it was time to see what it could offer us. We'd picked the full installation and so had all the packages available. In practice, though, the odds are that you'd want to split up the various components to reduce strain on a single machine.

The first surprise we faced was that management wasn't through Console One, the default point of administration for all Novell products. Instead, Novell has opted for management of the new features to be web-based. Simply point a web browser at the administration site running on the server, and take it from there. If you're familiar with administering a Netscape Enterprise server, then these screens will look familiar, as Novell licensed the technology from Netscape.

We found accessing the management information particularly easy. It may not be quite as flexible as a custom application for some operations, but it does allow administration from anywhere. In addition to providing web-based management for just the additional components of NetWare 5.1, Novell has also put in additional tools for dealing with the NetWare environment. It's now possible to manage NDS over the web as well. Granted, the web interface reduces how much you can actually do, but for simple tasks such as creating new users it's fine. The same comments go for the management portal that, while it may give access to the NetWare server directly, is not the easiest of tools to get to grips with, and certainly not ideal for large, complex tasks.

We decided to start with the FTP server, which provides a couple of useful extras. Instead of simply telling the software which directory serves as the root for FTP connections, we opted to make a user's home directory the root.



Top: Customising applications in NetWare 5.1

Bottom: Choosing installation options is easy using menus

Now, whenever a user logs on they'll get a view of all their own files, which is great for letting people get access to their work while they're off site. Thanks to NDS, FTP file permissions still depend on what the user has access to, so they only see what they're supposed to see. A similar feature appears in the web server that allows users to log in and see a page that they've set up.

At some time you may want to run multiple websites, each with a different domain name – but not necessarily running on a different machine. Novell has accounted for this with two methods: hardware and software virtual servers. A hardware virtual server allows the machine to have multiple IP addresses – one for each site, while a software virtual server resolves which website to display through the URL. The option any administrator chooses really depends on the local infrastructure.

While these products give access to the information you have on your servers, there's still the question of how you go about presenting and providing

access to that information. Novell has thought of this, too, with the bundling of IBM WebSphere. This is a suite of tools for building and serving applications over the web. Basically it performs that difficult job of creating the scripts to perform jobs. To give you an example, we used the software to create an HTML page to query a database. It was nothing special, it just retrieved some names based on the search string, but we managed to get it up and running very quickly. WebSphere won't make it look very pretty, but once you've got the script out of the way it's just a matter of performing a quick redesign on the web pages.

Overall, we were very impressed with NetWare 5.1. It still offers the same quality of file and print sharing that it always did, but now

it can help share that data to a wider platform. Perhaps the biggest change comes from the implementation of NDS 8. This is the part of NetWare that you may be least aware of, but it's the part of the software that makes everything work so well together.

DAVID LUDLOW

DETAILS

★★★★★

PRICE Starts at £987.72
(£840.62 ex VAT) for server with five-user licence

CONTACT Novell 01344 724 100
www.novell.com

SYSTEM REQUIREMENTS Pentium or higher processor, 1.3GB recommended free hard-disk space, 256MB of RAM recommended (512MB for WebSphere)

PROS Tight integration, good management, all you need to get up and running

CONS Some hardware issues on installation

OVERALL All the good points of NetWare 5, with superb ebusiness functionality



Cakewalk Pro Audio 9

A MIDI sequencer that uses innovative **WavePipe technology** to reduce the inherent latency of PCs.

Cakewalk is the odd one out in the MIDI sequencing world. While the two other major sequencers, Cubase and Logic, started out on the Atari ST, Cakewalk has always been a PC product, with its origins stretching right back to the days of DOS.

The last time we looked at Cakewalk was in February 1999, and back then it was in its eighth incarnation. This time around the changes are, on the surface, less drastic. However, if you take a look under the hood, the software has had some major enhancements – most notably the addition of the WavePipe sound card driver technology, but more on that later.

The main arrange window in Cakewalk is pretty similar to those of the other major sequencing packages, track parameters are on the left with colour-coded MIDI and audio data on the right. If anything, Cakewalk's main arrange window is a little less friendly on the eyes than its competition – it's certainly not as impressive as Cubase's brushed-metal look. The interface was upgraded substantially in the last version of the software, but it still lags behind the competition in terms of clarity and usability. Everything is there in its place, but it's not always as immediate as you'd expect.

That said, there are some neat touches. You can insert audio and MIDI effects on a track directly from the main arrange window, instead of having to call up the console's virtual mix window. This really is a time-saving shortcut, as it allows you to quickly try out how an effect is going to sound in the mix. You still have to use the console for assigning auxiliary effects, though.

Speaking of effects, Cakewalk is the only sequencer that has MIDI plug-in effects that are used in the same way as audio ones. This is another bonus, as you don't have to learn a new complex system to create MIDI effects such as delays – compared to the logical edit in Cubase it's a godsend. It's a pity then, that developers seem to be shying away



The console virtual mix view has to be used for assigning auxiliary effects

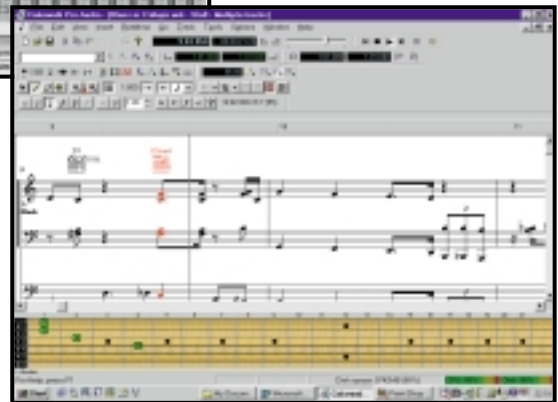
from Cakewalk's MIDI plug-in standard.

This release ships with a style enhancer MIDI plug-in from Russian company Ntonyx, that can be used to alter the feel of your music. You could, for example, place a reggae style on a MIDI rock guitar line! Also included as a MIDI effect is Session Drummer. This is a compositional aid for creating, yes you guessed it, rhythm tracks. Simply insert the plug-in on a MIDI track, select the

aid, you really are going to have to do some serious editing on the results if you want your drum tracks to stand out from the crowd.

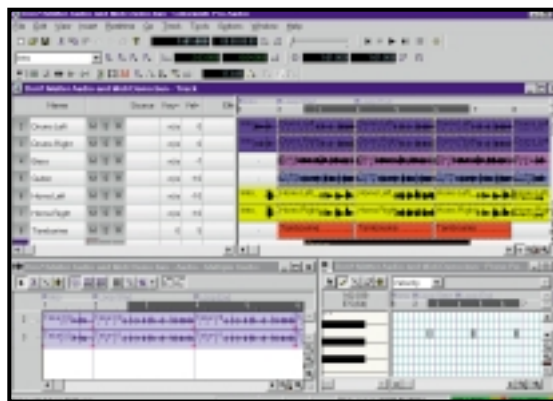
Unfortunately, other than these two MIDI plug-ins there's not much else out there for the format.

On the audio side, Cakewalk has generously thrown in a cut-



Guitarists will appreciate the new fretboard display

down version of the AmpSim plug-in, that can be used to simulate the sound of classic guitar amps. This was previously included in the special edition



The main arrange page in Cakewalk is functional rather than stylish

style and the plug-in will create a drum track to fit your music. You can then edit the results as you would any other MIDI track. It works well as a tool for creating fairly accomplished guide tracks to play along to but, as with any compositional

Cakewalk Guitar Studio product. It really does sound good when applied to guitar lines and will be appreciated by amateur producers everywhere, as it's notoriously difficult to record an authentic-sounding electric guitar track in a bedroom studio – as millions of feeble-sounding demo tapes testify. Even though this is a cut-down version of AmpSim, there are still plenty of options on offer for altering the tone and body of the resulting sound.

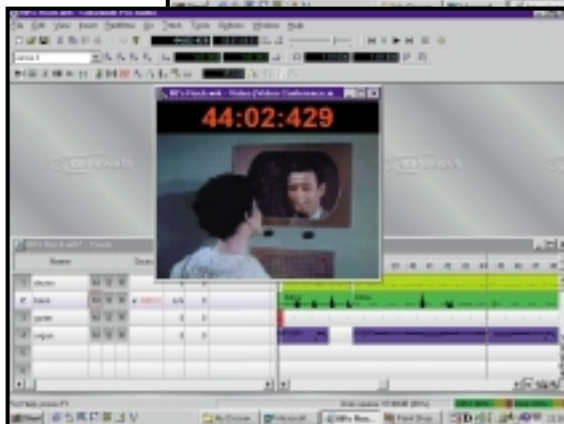
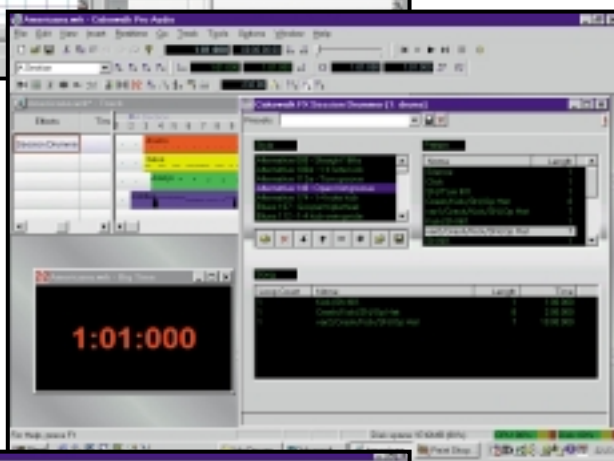
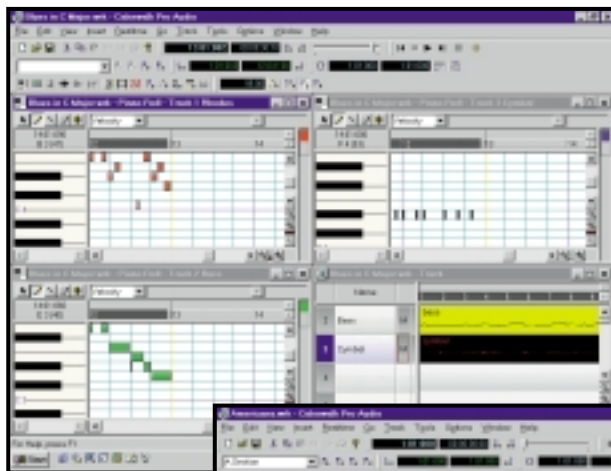
This isn't the only guitarist-friendly element stolen from Guitar Studio. Towards the bottom of the notation window, guitarists will find a guitar neck that displays notes and chords during playback. There's even a facility to export tracks in ASCII guitar tablature format, and Cakewalk has also added an instrument tuner.

The biggest change between version 8 and this latest release is the inclusion of WavePipe. Unlike an OS such as BeOS, Windows was not originally designed to handle audio processing in real time and, as a result, fetching audio from the input of a sound card, processing it and then returning it to the sound card's output introduces latency – a gap between playing a note into the computer and hearing it come out the other end. This makes it very hard to correctly monitor signals that are being recorded. Steinberg developed the ASIO driver format for sound cards to try to limit the problem, and other manufacturers, such as Emagic, have licensed this technology, but Cakewalk has decided to take a different route.

ASIO depends on manufacturers writing special drivers for their card, and most professional sound cards now come with these drivers, but consumer cards do not. Cakewalk promised that its WavePipe technology would work with the standard MME sound card drivers that come with every card, yet still manage to reduce latency.

So has it delivered? Well, yes and no. We tested the software on a 500MHz Celeron PC with both a cheap sound card based on Creative's AudioPCI chipset and a high-end Event Darla. On the Darla, WavePipe drastically reduced the latency to 44ms, but using the AudioPCI card the lowest we could get was 186ms – which is good for such a cheap card, but not quite as impressive as we had hoped. So it seems WavePipe depends a lot on both the quality of the drivers and the type of hardware used in the card. That said, if you're using a consumer card, you'll probably get much better results with Cakewalk than with one of the competing sequencers. It may be worth trying out a demo version to see how your card performs.

Another significant addition is



Top: Multiple tracks can now be edited simultaneously with the piano roll editor
Middle: Session drummer is one of the few MIDI plug-ins available
Bottom: It allows frame-accurate syncing of video to audio

AudioX. This is an additional sound card driver standard, but this time it's a driver designed to interface with those cards that have extra DSP horse power on-board for handling hardware mixing and effects processing. AudioX allows the special features of these cards to be controlled from within a sequencer, rather than having to use special standalone editing software. Currently, only the DSP Factory from Yamaha and the Sonorus STUDI/O cards come with these drivers, but seeing as Steinberg and

Emagic have announced support for AudioX, other sound card manufacturers should soon follow.

As far as MIDI is concerned, the only major update is that the piano roll editor has been upgraded to allow it to operate on multiple tracks at the same time. It even has the ability to intelligently control which tracks to hide and select.

Cakewalk is also now Internet-friendly. Finished tracks can be exported as MP3 (via the bundled Fraunhofer codec), RealSystems G2 or Windows

Media Advanced Streaming files. Those working with video files will be pleased to hear that the AVI, MPEG and QuickTime movie formats are supported, allowing you to open the files, edit the existing audio and then save them as AVIs. Frame-accurate syncing of video-to-audio and

the improved video and audio scrubbing, will help those who work on scoring video or multimedia projects.

Cakewalk is a very stable and capable platform for sequencing. What it lacks in style, it makes up for in its solid construction – the software performs well, even under the pressure of simultaneously playing back heaps of audio and MIDI tracks. The addition of WavePipe has gone a long way towards closing the latency gap between Cakewalk and sequencers that use ASIO technology. At this price there's little to beat it.

NIALL MAGENNIS

DETAILS

★★★★★

PRICE £279 (£237.45 ex VAT)

CONTACT Et Cetera 01706 228039

www.etcetera.co.uk

SYSTEM REQUIREMENTS Windows 9x, 200MHz processor (300MHz recommended) 64MB of RAM (128MB recommended), 78MB free hard-drive space,

PROS Very stable, WavePipe works well, good features for guitarists, cheaper than competitors

CONS No VST support for effects and native instruments, interface could be more appealing

OVERALL A very stable sequencing platform that doesn't skimp on features, ideal if you're using a consumer sound card



PERSONAL COMPUTER WORLD

Bestbuys

ENTRY-LEVEL PC

Carrera Lynx W533



Sporting Intel's 533MHz Celeron CPU, this PC is built around a PC99-compliant Supermicro motherboard with on-board sound and graphics. There is 128MB of RAM installed as a single PC100 module and the bundled monitor is a 17in model from Hansol. Also included is a Panasonic DVD drive, an AMR V.90 modem and a 12.6GB IBM Deskstar hard disk.

Review April 2000, p73 **Price** £821.33 (£699 ex VAT)
Contact Carrera 020 8307 2800 www.carrera.co.uk

MID-RANGE PC

Atlas Meridian A850



This is a very well-specified machine with its 850MHz Athlon chip, 128MB of RAM and 22GB IBM Deskstar hard disk. The impressive Hercules 3D Prophet DDR-DVI graphics card drives a 19in Mitsubishi Diamond Pro 900u monitor which produces a crisp image at a resolution of 1,280 x 1,024. If you're after the latest AMD has to offer, this should top your list.

Review April 2000, p81 **Price** £2,109 (£1,795 ex VAT)
Contact Atlas 07000 285 275 www.atlasplc.com

HIGH-END PC

Hi-End Armari R8-S2000



The R8-S2000 from Armari is a cracking machine for developers, renderers, or just about anyone who fancies an unbelievably responsive system. The build quality and choice of components from Armari are superb and the 840 chipset in particular looks like it could beat at the heart of this year's highest performing PCs.

Review April 2000, p74 **Price** £3,288.83 (£2,799 ex VAT)
Contact Armari 020 8993 4111 www.armari.com

FULLY-FEATURED NOTEBOOK

Gateway Solo 9300 LS



Making use of Intel's 600MHz SpeedStep processor this notebook has blistering performance. The screen and keyboard are both excellent, and the notebook enables you to do some basic video editing using the composite in and out ports at the back through the ATi mobility video card, or for digital video there's a FireWire port.

Review April 2000, p158 **Price** £2,348.53 (£1,999 ex VAT)
Contact Gateway 0800 55 2000 www.gateway.com/uk

ULTRA-PORTABLE NOTEBOOK

Sony Vaio 505SN



The latest in the popular 505 range is just as much a smash hit as the previous incarnations. Using a Pentium II 400MHz processor and 64MB of RAM, it makes an excellent compromise between speed and portability. The TFT screen has an amazing 1,024 x 768 resolution and, despite its tiny size, the keyboard is still extremely comfortable to use.

Review April 2000, p180 **Price** £1,702.57 (£1,449 ex VAT)
Contact Sony 0990 424 424 www.sony.co.uk

PDA

Psion Series 5mx



Retaining the Series 5's good looks, the 5mx has 16MB of memory and a processor speed of 37MHz. The email software is built into the ROM and now supports UUEncoded attachments and MIME for both incoming and outgoing messages. The web browser has also been upgraded to support frames and Java 1.1.4.

Review August 1999, p92 **Price** £429.99 (£365.91 ex VAT)
Contact Psion 0990 1430503 www.pSION.com

DIGITAL CAMERANikon
CoolPIX 700

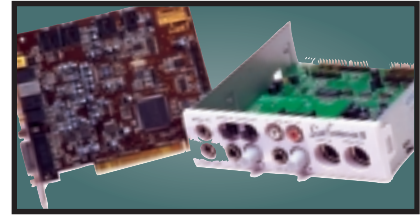
Both physical controls and the on-screen menu system are well laid out and the results from the 2.1 megapixel CCD are impressive – wonderfully clean, detailed, natural-looking images at 1,600 x 1,200.

Review January 2000, p175 **Price** £499 (£425 ex VAT)
Contact Nikon 0800 230 220 www.nikon.co.uk

WEBCAMCreative
WebCam Go

Not only is this a regular webcam offering 30fps at 352 x 288 or 15fps at 640 x 480, but when you disconnect the USB cable it becomes a standalone digital camera that can store JPEG images on its internal 4MB memory.

Review March 2000, p78 **Price** £119 (£101.28 ex VAT)
Contact Creative Labs 0800 973 069 www.europe.creative.com

SOUND CARDCreative Labs
SB Live! Platinum

This is exactly what gamers and budding PC musicians have been asking for – great sound quality and excellent bundled software make it a winner. We think it's the best sound product ever.

Review February 2000, p83 **Price** £167 (£142 ex VAT)
Contact Creative Labs 0800 973 069 www.soundblaster.com

COLOUR INKJETHewlett-Packard
DeskJet 895CXi

For all-round excellence you can't do better than the HP 895CXi. The quality of its output for both text and graphics is impressive given the swift speed at which they are produced.

Review October 1999, p177 **Price** £210.32 (£179 ex VAT)
Contact Hewlett-Packard 0990 474747 www.europe.hp.com

BUDGET LASER PRINTERBrother
HL-1250

This compact machine has everything you could reasonably ask for at the price, but Brother has gone one step further with the inclusion of both parallel and USB ports.

Review February 2000, p165 **Price** £245.58 (£209 ex VAT)
Contact Simply 08707 297 366 www.brother.com

COLOUR PHOTO PRINTEREpson
Stylus Photo 750

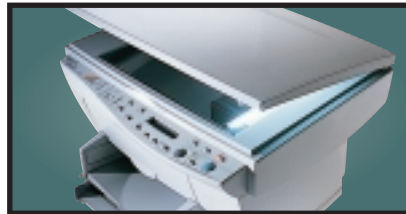
Easy installation, a five-colour cartridge for photo printing and feature-rich software make this printer attractive. Its photo reproduction could not be faulted and job turnaround is fast.

Review October 1999, p180 **Price** £199 (£169.36 ex VAT)
Contact Epson 0800 220 546 www.epson.co.uk

BUSINESS LASER PRINTERHewlett-Packard
LaserJet 4050TN

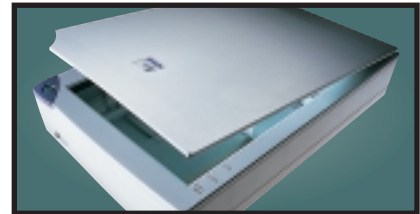
The 4050TN's 1,200dpi resolution is outstanding, and with a 133MHz NEC processor and 16MB of RAM it can turn out 16ppm. It also comes network-ready as standard.

Review September 1999, p96 **Price** £1,580.38 (£1,345 ex VAT)
Contact HP 0990 474747 www.europe.hp.com

MULTI-FUNCTION DEVICEHewlett-Packard
Office Jet R45

A 600dpi colour inkjet printer, colour scanner and a fax all in one. Colour output is rich and vibrant. The 30bit scanner supports a maximum optical resolution of 600dpi.

Review November 1999, p96 **Price** £478.23 (£407 ex VAT)
Contact Hewlett-Packard 0990 474747 www.europe.hp.com

FLATBED SCANNEREpson
GT-7000 USB

This 600dpi scanner has good colour accuracy, text reproduction and picture quality. USB installation is a breeze and we were impressed with the robust build quality.

Review November 1999, p191 **Price** £149 (£126.81 ex VAT)
Contact Epson 0800 220 546 www.epson.co.uk

GRAPHICS CARDCreative Labs
Annihilator Pro

Based on the DDR version of the GeForce 256 chipset from nVidia, this card offloads transform and lighting effects processing from your CPU to give outstanding results.

Review March 2000, p80 **Price** £218 (£186 ex VAT)
Contact Creative Labs 0800 973 069 www.europe.creative.com

EIDE HARD DRIVESeagate
Barracuda ATA 28GB

This 28GB beast's spin speed of 7,200rpm helped it achieve 0.89Mbytes/sec in our random read and write test. It's a breeze to install and the £5.10 cost per MB makes it a bargain.

Review April 2000, p197 **Price** £168 (£143 ex VAT)
Contact SMCdirect 01753 550333 www.seagate.com

SCSI HARD DRIVESeagate
Barracuda ST150176LW

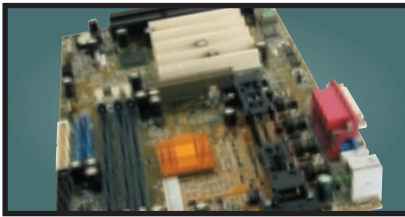
The Barracuda may no longer be at the cutting edge of SCSI performance, but with its 7,200rpm spin speed and 50GB storage space its value for money is outstanding.

Review April 2000, p202 **Price** £645 (£549 ex VAT)
Contact SMCdirect 01753 550333 www.seagate.com

SLOT 1 MOTHERBOARD**Supermicro
Super PIIISCA**

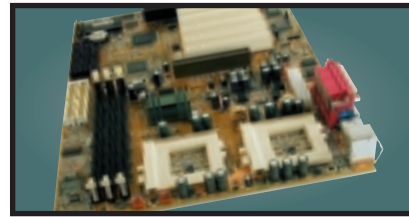
Targeted at people looking to upgrade their systems, this board includes both DIMM and RIMM slots. The documentation is excellent, and all the necessary cables, RIMM spacer and driver CD are included in the box.

Review March 2000, p186 **Price** £128.08 (£109 ex VAT)
Contact Dabs Direct 0800 138 5124 www.supermicro.com

SLOT A MOTHERBOARD**Gigabyte
GA-7IX**

This board has four PCI slots, one ISA and one shared slot. It was very stable in our tests and the manual spells out clearly what the jumpers do and takes you through each of the Award Modular BIOS settings step by step.

Review March 2000, p182 **Price** £105.75 (£90 ex VAT)
Contact Dabs Direct 0800 138 5214 www.gbt-tech.co.uk

SOCKET 370**Abit
BP6**

The BP6 allows you to use Intel's socket 370 Celerons in a dual-processor configuration. Even if you only use the board for a single processor, the BP6 still shines because it is one of the few Socket 370 boards to use the BX chipset.

Review March 2000, p195 **Price** £116.33 (£99 ex VAT)
Contact Top PC 0113 2422 416 www.abit.com.tw

17IN MONITOR**CTX
PR711F**

Using a Sony FD Trinitron tube, this monitor's slim casing somehow makes the display seem larger. Image quality is superb and a USB hub is built in to the base as standard.

Review January 2000, p79 **Price** £276.12 (£235 ex VAT)
Contact Dabs Direct 0800 138 5124 www.ctxeurope.com

19IN MONITOR**Taxan
Ergovision 980**

Based on the 19in Mitsubishi Natural Flat Diamondtron tube, this offers superb image quality and comprehensive OSD. There's also a built-in USB hub.

Review November 1999, p208 **Price** £586 (£499 ex VAT)
Contact Taxan 01344 484646 www.taxan.co.uk

21IN MONITOR**Sony
GDM-F500**

Sony's flagship monitor has a 21in FD Trinitron tube and excellent image clarity. Its aperture grille pitch is just 0.22mm and it can achieve a resolution of up to 1,880 x 1,440 at 80Hz.

Review April 1999, p189 **Price** £1,292.32 (£1,099 ex VAT)
Contact Sony 0990 424424 www.sony.com

LCD MONITOR**Sony
SDM-N50**

This TFT display is a svelte 1.3cm thick and the screen is easy to position with its multi-pivoted stand. The display quality is first rate and it even has built-in speakers and a headphone socket.

Review April 2000, p96 **Price** £1,173.82 (£999 ex VAT)
Contact Sony 0990 424 424 www.sony.co.uk

SOUND SYSTEM**Videologic
DigiTheatre**

This set includes five speakers, a subwoofer and an integrated six-channel amplifier plus a decoder. Excellent sound quality at a fair price make the DigiTheatre a must-have.

Review January 2000, p81 **Price** £249 (£211.91 ex VAT)
Contact Videologic 01923 277 488 www.videologic.co.uk

CD-RW**Creative CD-RW Blaster
CD Studio**

This sterling package includes the 4 x 4 x 24 EIDE CD-RW drive and everything you need to mount it in your PC. Bundled software includes the Nero Burning ROM CD writing program.

Review March 2000, p84 **Price** £175 (£149 ex VAT)
Contact Creative Labs 0800 973 069 www.europe.creative.com

ISDN TA**Eicon
DIVA USB**

Weighing in at 70g and no larger than a mouse, this USB ISDN TA opens up 128Kbits/sec bandwidth and supports G3 and G4 faxing as well as a variety of voicemail and file transfer facilities.

Review March 2000, p87 **Price** £99 (£84.35 ex VAT)
Contact Eicon Technology 020 8967 8000 www.eicon.com

BACK-UP**OnStream
SC30**

The SC30 has a 30GB compressed data capacity and using Backup Exec it achieved over 70Mbytes/min. Echo software provides drive-letter access so you can treat it like a hard drive.

Review September 1999, p102 **Price** £233.82 (£199 ex VAT)
Contact OnStream 0800 328 1204 www.onstream.com

REMOVABLE STORAGE**Panasonic
LF-D101 U**

This unit not only reads CD-ROM and DVD-ROM discs, but it also writes to PD and DVD-RAM discs, offering safe and affordable high-capacity backup.

Review October 1998, p98 **Price** £391.71 (£333 ex VAT)
Contact Dabs 0800 138 5204 www.panasonic.co.uk

gadgets

compiled by Niall Magennis

Two ways to get in style

Get out your old elbow-padded army jumpers, because walkie-talkies are back. The palm-sized, rechargeable TalkAbout 288 from Motorola has a two-mile radius in open terrain and sports more than 300 combinations of frequencies, so it's easy to find a free channel and check with your mates that everything's '10-4'. Best of all, there is no licence required or call charges to pay. With a range of colours and accessories, it's cutting-edge and cool enough to get you talked about too.

Price £129 (£109.79 ex VAT)
Contact Motorola 0500 500 500
www.motorola.com



Wrap-around music

If you want an MP3 player to really impress your friends, the Casio WMP-1V has got to be it. The watch has enough memory on board to store around 33 minutes of CD-quality audio. Files can be downloaded quickly via a specially designed, miniature USB port. There's even animated characters with 10 different dance styles. All this and it's water resistant too!

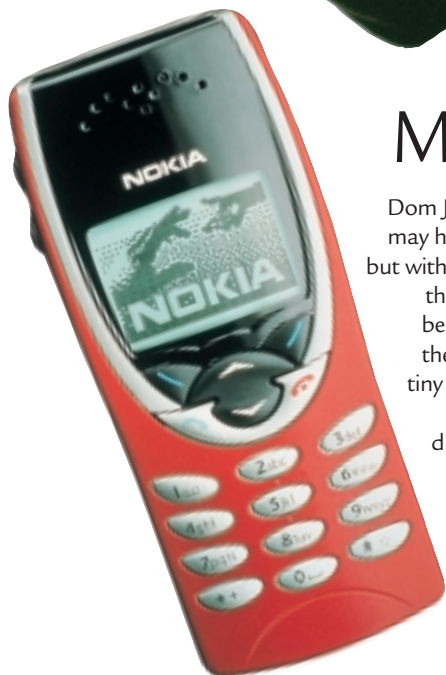
Price £200-£250 (£170.21-£212.77 ex VAT)
Contact Casio 020 8450 9131
www.casio.com

Mini-mobile

Dom Joly from C4's *Trigger Happy TV* may have the biggest mobile phone, but with the Nokia 8210 you can have the smallest. Measuring a mind-bending 101.5 x 44.5 x 17.4mm, the only problem is the unit is so tiny people won't believe it's not a children's toy. The graphical display shows up to five lines of text and supports picture messaging. Other treats include voice dialling and predictive text input.

Price £229 (£194.89 ex VAT) with connection or £500 (£425.53 ex VAT) without connection

Contact Nokia 0990 003 110
www.nokia.com



Room for manoeuvre

If you're frustrated by the storage limitations of most MP3 players, you might want to check out this monster from Remote Solutions. The Personal Jukebox's built-in 4.8GB hard drive has the capacity to store around 1,200 MP3 files - more than enough to cover Mr or Ms Average's entire CD collection. Weighing in at 9.9 ounces with dimensions no bigger than a video cassette tape, it's fine to clip to your belt and walk around, but a tad bulky to take jogging.

Price Approx £500 (£425.53 ex VAT)
Contact Remote Solutions www.pjbox.com/
(only available from the US)

Super sonic station

Those who think the Commodore C64 was the height of computer sonic excellence have the chance to relive those memories all over again thanks to Swedish synthesiser company Elektron. It has taken the C64's SID sound chip and used it as the basis of a new synthesiser – the SID Station. You'd better hurry, though, as the company only plans to make around 100 units.

Price SEKroner: 5,125 or £375 (£319.15 ex VAT)

Contact Elektron 00 46 31 772 8110

www.sidstation.com



On reflection

We here at PCW are fed up with translucent, garishly coloured mice, so it's a refreshing change to see a rodent manufacturer opt for a sleek, chrome look. The Cromo Mouse from Lindy even has a programmable third button. There's only one real problem, it's not quite as sexy as the Intellimouse Explorer from Microsoft.

Contact Lindy 01642 754 000

www.lindy.co.uk

Price £39.99 (£34.03 ex VAT)



Gun control

PC owners who are fans of light gun games haven't had much choice when it comes to light gun controllers. In fact there weren't any available, but Act Labs has changed all that with its Gun System. The company has worked with software developers to ensure that support will be forthcoming and claims that independent developers are working on 'mods' for use with existing titles. A handheld controller that has mouse-emulation comes bundled with the gun for use in first-person-shooters such as Quake III.

Price £62.50 (£53.19 ex VAT)

Contact Act Labs www.act-labs.com



Feel the width

The NEC PlasmaSync 42PD1 has a 42in Plasma screen with a built-in, screen-dividing function for using four or more monitors as a video wall. It also has an on-board PC which allows the unit to be controlled over a network. We reckon it'd be the mutt's nuts for playing Unreal, but you're not likely to get a chance to try this – unless you're the Sultan of Oman.

Price £8,812.50 (£7,500 ex VAT)

Contact NEC 0645 404 020

www.nec.com



Pied piper

ERIC RAYMOND'S **EVANGELISTIC ATTITUDE** TO LINUX MADE CORPORATE AMERICA SIT UP AND FOLLOW HIS LEAD. CLIVE AKASS ASKED HIM ABOUT LINUX AND WHY HE THINKS MICROSOFT IS ON THE WAY DOWN.



OF ALL THE DOGS BARKING at Microsoft's heels, Linux is the most immediately appealing. It promises victory for the small over the large, the individual over the corporate, the geek over the suit. It is driven by the inspiration of Linus Torvalds; but were it not for an oddball coder called Eric Raymond, it might still be the private sport of propeller heads. Raymond's evangelising, particularly in a famous paper called *The Cathedral and the Bazaar*, is generally credited with making corporate America take Linux seriously.

Raymond and Linux both have roots in the counter culture from which computing has drawn much of its energy and ideas. But although Silicon Valley sprouted from San Francisco, mecca of Sixties hippies, we are not talking flower power. Sixties idealism spawned terrorism too, and in some Americans it soured into a paranoid libertarianism. Raymond, gun lover and fierce opponent of gun control, is more Dirty Harry than dippy hippy – though, limping slightly as a result of cerebral palsy, he looks quite vulnerable at first sight.

He sees himself as spokesman, historian and 'loremaster' of the hackers – not the cyber-intruders that make the headlines, but in the older sense of people drawn together on the evolving Internet by a love of programming and a distaste for big organisations. The kind of people who, under Torvalds' direction, built Linux.

Raymond spent his early years in various countries, including 18 months in Britain – his father worked for a multinational. He was seen as something of a prodigy at maths, but dropped out of college after teaching himself

ILLUSTRATION SIMON PEMBERTON @MONSTER



programming. He spent a year working on an artificial-intelligence project before joining a Philadelphia software house where he got his hands on one of the first IBM PCs. 'For about a year I was actually writing for the Microsoft environment,' he said, as if owning up to robbing a bank.

He moved to Malvern, Pennsylvania, to join a startup called Rabbit Software and published his first book, *Portable C and Systems Programming*, in 1985. He has lived in Malvern ever since, working as a writer, freelance programmer and consultant.

The Cathedral and the Bazaar, posted on the web in 1997, contrasts the formal enterprise of the cathedral builder with the free-for-all coming together of the bazaar; what shook IT companies was its proposition that the apparent anarchy of Linux development, with anyone free to modify source code, is actually more efficient than traditional processes because, in effect, it is parallel processing by the best-equipped brains: those actually using the software. Debugging becomes a continuous process 'not just of code, but also of designs'.

Raymond also pointed out that the method was not new. Hackers had been at it since the Seventies, swapping and modifying each other's programs over a variety of networks that were eventually subsumed into the Internet. 'We didn't have a name for what we were doing. We just did it,' said Raymond, who first used ARPAnet, precursor to the Internet, in 1976. 'It's difficult to

put over how unconscious it was back then. We didn't have the well defined identity that we do now.'

One event that helped build that identity was the creation during the 1970s of the Jargon File, which defined some of the language of the new community. Raymond did his bit in 1991 by publishing an updated version as *The New Hacker's Dictionary*.

More important was the emergence in 1984 of the Free Software Foundation, with its GNU software library and public licences, under the brilliant but eccentric ex-MIT student Richard Stallman – someone as far to the left of the counter culture as Raymond is to the right. The two met in the early Eighties at a sci-fi convention and, according to Raymond, remain good friends; but their differences were to lead to public warfare.

Stallman disapproves of intellectual property. 'He tried with some success to redefine the whole community in his own image as a software crusader,' said Raymond. 'But there were a lot of refusniks around and I was one of them. I like intellectual property. I think it is a good idea. There are smart ways to use it and stupid ways to use it. And making your code secret turns out to be one of the stupid ones. I wanted to share code because you get better programs that way.'

Stallman was eclipsed by Torvalds when Linux came along. Raymond got his first Linux distribution in 1993. 'It's hard to describe how shocked I was. What was so effective about what



the Linux people were doing? It was a continuation and intensification of cultural patterns I had been noticing on the Internet since 1976.'

That reaction was nothing to his astonishment at the explosion of interest in *The Cathedral and the Bazaar*. 'It was not as if I had discovered anything in a real sense. I just described what people had been doing all along. But the fact of supplying a language, the fact of supplying a narrative, can really catalyse people's thinking. And that is what I did.'

One result was that Netscape opened the source code of its browser. Another was that Raymond got involved in a meeting on the future of Linux, attended by anybody who was anyone in the hacker community - except Stallman. Raymond says he argued against this exclusion but it was felt that Stallman would 'ideologically disrupt proceedings'. The Stallman and Raymond camps are still bickering.

It was at this meeting that the term 'open source' was adopted as an alternative to free software. 'We realised that we had to market Linux. And we needed a neutral term which would not frighten off the suits.'

Raymond speaks of Torvalds with something close to adulation. 'He's a wonderful human being and I am very proud to count him as a friend as well as a colleague,' he said.

Such allegiance raises the question of how much Linux's success is due to the development method, and how much to Torvalds. Mozilla, the open-source development of Netscape Navigator, has yet to gain serious momentum. Raymond said this is because the old Netscape source code

focus. Even Linux is making its mark mostly in specialist boxes such as web servers and firewalls. Could open-source development really produce a friendly general-purpose operating system matching the features and hardware support of Windows?

Raymond's response was a dissertation on why Microsoft will be a spent force within 18 months. How the anti-trust case will lead to a rush of law suits by people entitled to triple damages; how the company could be done for tax evasion and dubious accounting practices. And did I not know that Windows 2000, set to launch on same day as the latest Linux kernel (see news), was in deep trouble?

'It has 35 million lines of new code. Not modified old code. New code. Do you have any idea how much that is? I'll scale it for you. You remember that flap about the Star Wars system in the 1980s? People said it was so complicated it couldn't be made to work. The code for that was 25 million lines. We are talking about an operating system in which the new code, leave alone the old code, is as third as big again.'

Pointing out that Windows 2000 had been through the hands of tens of thousands of beta testers, whereas the only way to test Star Wars was to start a war raised a laugh, but he replied that: 'Windows 2000 has exceeded the level of complexity at which traditional development is viable.'

He had still not finished his tale of Microsoft woe. Few people, he said, know that the company made 36 per cent of its income from 'playing option games with its own stock prices. If the stock price falls enough to cause a loss of investor confidence it's going to nosedive really fast'.

The PC market is not growing fast enough to generate the income needed to stave off this vicious spiral. So Microsoft is forced to squeeze more money from existing markets, loading more costs onto important customers and cutting the margins of PC builders.

'The trouble is that hardware prices are falling like a rock. Let's say the Microsoft "tax" is \$80 to \$100 per machine. Doesn't look so bad if your system price is \$2,500. But if it is down to \$300 you have got a problem... There will come a point when each PC integrator realises: "I can't make any money by partnering with Microsoft".'

Something like this last scenario is certainly generating some of the interest in Linux. But speaking to Raymond, what strikes you is not so much his argument, but the glee with which he speaks of a Microsoft crash. You can't help feeling that, with the US Government's case against Microsoft not affecting its stock price too adversely and Windows 2000 not the disaster that many of its adversaries has hoped, Raymond may be a bit ahead of himself in his predictions on Microsoft's future.

● *The Cathedral and the Bazaar* is now available in updated and expanded form as a book costing £12.95 from O'Reilly (ISBN 1-56592-724-9).



Raymond: Spokesman, historian and 'loremaster' of hackers

was such a hotchpotch that it has only recently been honed to a point where co-operative development could begin.

He insisted: 'Linux is not a special case. It is not the only open source software. Just about all the core software of the Internet is open source. Apache, which runs one in three web servers in the US, is open source.'

But these are all programs with a narrow

→ 50

GO!

GO!



GENTLEMEN, START YOUR SEARCH ENGINES!

28.27.26.25.24.23.22.21.20.19.18.17.16.15.14.13.12.11.10.09.08.07.06.05.04.03.02.01.



50 *web tips*

BEN TISDALL HAS 50 WAYS TO ENSURE YOUR WEBSITE BABY HAS **THE BEST CHANCE OF SURVIVAL** IN AN EXPLODING INTERNET POPULATION

IT'S NOW UNBELIEVABLY CHEAP to register a domain name and even free ISPs offer you tons of web space for nowt, so there's little reason for anyone not to have their own website. The problem is, how do you create a website that will attract and hold the attention of more than just you and your friends?

We've gathered together 50 top tips on how to make your website more professional, covering everything from ease of use to speedier performance over low-bandwidth links. Whether you're a designer or a programmer, a web beginner or a web expert, there should be something here to make you think twice about how you commit your code to page. The first 20 or so tips are general guidelines to what approach you should take to creating and maintaining your site, while the more in-depth technical tips can be found towards the end.

You may notice a speed theme popping up again and again throughout our tips. That's because poor website performance will lose you more visits than any other single factor. That said, the way a website looks and feels must be tailored to its audience. If you're aiming for 16-25 year olds, a site still needs to be fast but mustn't be boring. On the other hand, sites aimed at people over 45 should treat speed and simplicity as the overriding factors that contribute to a positive surfing experience. Those websites targeting senior managers in blue-chip companies, where the visitor is likely to have fast, leased lines straight to their desktops, can afford to use richer multimedia content.

Similarly, how a website is designed is influenced by what it will be used for. If you're buying a car online you won't mind waiting 30 seconds or more for a good quality photograph to download, but if you're buying a book, 10 seconds to download a shot of the cover probably isn't fast enough.

You also need to have a long hard think about why you're creating a website. Lots of websites, from tiny, one-person operations to multi-million dollar super-sites, come unstuck because this has not been fully thought through. Don't create a website just because everyone else has one. For a site to succeed it has to serve the needs of the company or individual who's created it, but it also has to cater for the needs of the people you want to visit it.

Finally, think of the big picture. You can devote enormous efforts to the design and structure of a site and completely overlook factors like customer service or how to update the site after it has been created. And there's no point in creating a super website if no-one knows about it. The subject of web marketing is beyond the scope of this article. However, it's something you must consider carefully, whether your marketing campaign consists of simply registering with the main search engines or booking 60-second ads in the middle of *Coronation Street*.

ILLUSTRATION RICHARD MAY

01 Look at best-of-breed websites Look at what the world's leading websites are doing and borrow some of their interface conventions. For example, Amazon.com and eToys.com are two of the slickest and best ecommerce sites in the world, so if you're setting up this kind of site, have a close look at how they do it. Ecommerce sites need to have clear, well-defined paths to making a transaction. Give users an easy and short path to the till.

02 Put a search button on every page Any website with more than a hundred or so pages should be searchable. If people get lost somewhere on your site, instead of just bailing out altogether they'll often use the search facility to move on to where they want to go.



Cnet, among others, has done away with side menus in favour of less space-hungry menus at the top of the screen

03 Speed is paramount You have just seconds to convince a surfer not to use the Back button. Make sure you get something on the screen immediately and make it interesting. Most people will probably wait around 30 seconds for everything on-screen to load but that's an absolute maximum. Be as fast as you can.

04 Think about the menu structure A couple of years ago the convention – that was first started by Cnet – was to have a menu button down the left-hand side of the screen. But over the past year or so most of the big sites have moved away from this approach. Sites such as Amazon and Cnet now use menus along the top of the screen.

It's not hard to see why. On a small screen it's a big waste of space to kiss goodbye to 120 pixels or so on every single page. Bear in mind that any changes to your main

template and menu bars are going to be very time-consuming to implement. Try and get it right first time.

05 Stick to user-interface conventions For example, with radio buttons, the correct way of using them is to give users a series

of radio button options and then invite them to click an OK button. Some dubiously designed websites use radio buttons as action buttons, but this just confuses users. Tick boxes also come in for similar abuse. Although we don't recommend left-hand menu bars it is at least a convention. For heaven's sake don't put a menu bar on the right of the screen.

06 Don't use unnecessary graphics In particular, avoid putting text like headlines or introductions into GIF format. Having to download these additional pictures slows download times and annoys users. Nearly all the leading sites now use text buttons for their menu bars, which shows what you can achieve with simple HTML, CSS and perhaps a bit of JavaScript.

07 Use the space above the fold Most of your users will be looking at a website on a 13-15in screen and the top four vertical inches are all that will definitely be visible on their screen. This section of the screen is known as being 'above the fold' and it's vital that you put your most important and attention-grabbing stuff there.

08 Don't forget design principles In the early days of desktop publishing people delighted in cramming as many different fonts and graphic effects as possible onto their newsletters and publications – simply because they could. The same design flaws afflict many web pages today. Remember that two fonts on a page in a couple of different weights are probably as many as you can get away with.

09 Use image maps If you must have a menu bar that uses graphics – and you should probably avoid this anyway – then try using a single graphic and an image map instead of eight or 10 separate graphics. The overall file size will be lower.

10 Use JavaScript, animations and other fancy stuff sparingly Animations annoy users and are often ignored because people tend to subconsciously filter out anything that looks like an advert. JavaScript is a brilliant tool for adding interactivity to web pages. Images can change when you move your cursor over them, calculations can be made, form elements can interact on-the-fly. However, many websites make the mistake of prettying up their pages with completely unnecessary JavaScript. This slows things down and can lead to incompatibilities and glitches with some browsers.

11 Avoid frames Frames were all the rage a couple of years ago. These days you'll be hard put to find any professional site that still uses them. They tend to make navigation confusing and frustrate anyone trying to print out information from your website, as only the active frame will be sent to the printer. Nevertheless, for small or personal websites they can still be an appropriate way of arranging information.



12 Carry out some usability testing

Companies like Microsoft spend millions of dollars on this using one-way mirrors, video cameras and professional ergonomists. Even on a small scale it's worth doing usability testing. Just get some people who are similar to your target audience to try out your website. Watch them using the site and ask them what they think of it.

Designers and programmers can get very blinkered by working too close to a project. In the early days of Microsoft's usability testing its programmers were extremely sceptical about the value of the feedback they were getting. Their attitude was that the usability team had just found 20 stupid people to test out the software. It wasn't until techies attended some sessions themselves and watched people trying to use Word for DOS that they realised how difficult the product was to use.

13 Test on different browsers This might sound obvious, but it is easy to overlook in the rush to get a website up and running. Generally speaking, Internet Explorer is much more tolerant of errors than Netscape Navigator. One little mistake in a table is enough to generate a blank screen in Navigator. Also, get hold of older versions of the browsers and try the site on those too.

14 Keep tables simple Complex tables take a while to render. Cut down on the complexity of tables by splitting information into several smaller tables. In particular, the top table above the fold needs to be simple and appear on screen quickly.

15 Think about screen resolutions Many websites still write for screens of 640 x 480. But increasingly web designers are setting 800 x 600 as the minimum resolution. Make sure you check how your website looks at this resolution. Web designers and programmers usually have big monitors and fast computers. It can be quite an eye-opener to see how little of a website you can see at this resolution with Windows menu bars at the top and bottom of the screen. Some websites actually repeat some of the key elements further down or at the bottom of the screen so that users don't get lost when they scroll down the page.

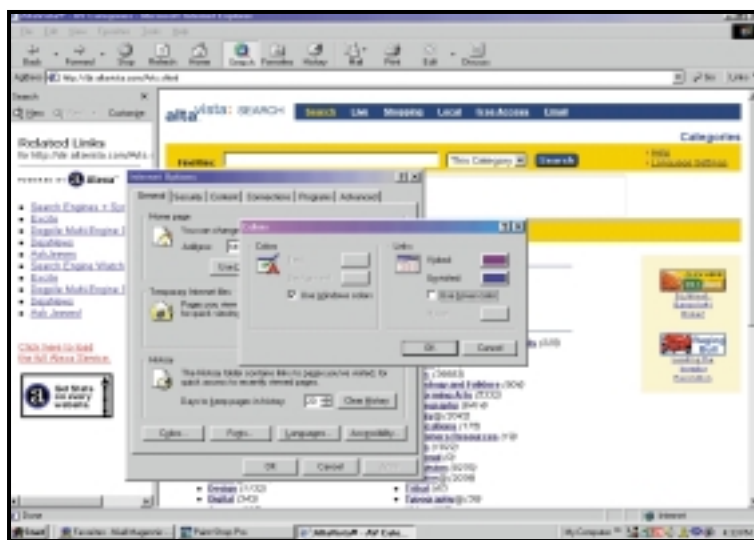
16 Avoid headlines that are hard to understand In newspapers and magazines it's considered perfectly reasonable to use abstract headlines to introduce a feature. Sub-editors, who write them, are paid to be a bit clever and entertaining to catch the readers' attention. On the web, headlines need to be more literal because they're often taken out of context. For example, 'The moving image' is a good headline for a magazine article about video editing, but taken out of context in a list of search engine results it's meaningless.

17 Think about table widths Using HTML you can set tables at a particular width or let them flow across the screen. Some of

the best websites use a mixture of both strategies. If you fix table width right across your site you can end up looking rather silly on a screen set at 1,152 x 864 or above. You're also not making best use of the screen space available. On the other hand if you don't fix table widths at all your website can look like a badly designed mess.

18 Don't mess with link colours The standard colours are blue for links to unvisited sites and purple for links you have already visited. You can change these colours, but it's a bad idea. Design conventions on the web are what make websites easy to use.

19 Think about printing People are likely to want to print out any document longer than a couple of hundred words that appears on a website. Because of this, you should make sure the pages that people are likely to want a hard copy of, print properly. Users will find it extremely annoying if, when they print something from your website, the end of every line disappears off the right margin.



20 Don't use absolute font sizes Your web pages will get viewed on all sorts of computers with all kinds of different sizes of screen. For example, type displayed in Windows looks two to three points larger than the same font viewed on a Macintosh. People also have different personal preferences. It's annoying for surfers if they go to change the text size on their browser and nothing happens.

21 Choose the right fonts Typefaces like Georgia, Geneva and Verdana are designed specifically for legibility on computer monitors. Their x-heights (the height of a lower-case x) are exaggerated and they appear larger compared to more traditional typefaces in

Chameleons not required: Use blue for unvisited links and purple for those already visited



the same point size. However, they don't look good on paper. For long documents that you expect users to

print out, consider using fonts like Arial or Times Roman, which have been designed for paper.

22 Limit line length A line longer than about 12 words becomes difficult to read. Consider using two columns of text on text-heavy pages as it will make them easier to read. The easiest way to do this is to place your document inside a table with two or more columns. The HTML to do this can be seen below. Setting cell spacing to seven gives you a reasonable amount of space between the two columns.

```
<table border=0 cellspacing=7>
<tr>
<td>Text for first column...
<td><br>
<td>Text for second column...
</table>
```

23 Use cascading style sheets (CSS) There are problems with style-sheet compatibility between different browsers. At the time of writing, the two dominant browsers - Netscape and Internet Explorer - still don't render CSS in identical ways. However, CSS does have some big advantages. In the UK, use of Internet Explorer is now well ahead of Netscape Navigator, and IES has full support for CSS, so you can be confident that the majority of users will be able to use all the features. CSS has two



Make a splash: If it's right for your website use a splash screen

key advantages for people managing large websites. Firstly, it allows control over how each HTML tag will look and secondly it gives you the ability to control the graphical look and feel of thousands of pages by changing a single master style sheet document.

And don't forget, style sheets will also speed up download times, because you don't have to

include lengthy font tags in every table cell. Provided you use linked style sheets, only a single style sheet has to be downloaded for your whole site. Also, make sure pages work when style sheets are disabled. To try this just disable style sheets in your browser and reload the page.

24 Allow individual styles Although it's best to use style sheets, you will probably have some pages where a different style is appropriate. Just embed local styles in the special pages, but don't go overboard on individual styles, it's best to link to the global style sheet on most pages for the sake of consistency.

25 Take care with advanced style-sheet features By all means use style sheets, but steer clear of some of the more advanced features that won't really work properly in Netscape Navigator. It is possible to detect which browser someone is using and serve up a page specifically for that browser - ie have two different versions of a page. This is best avoided, though. Trying to maintain multiple versions of identical pages is asking for trouble.

26 Try to avoid pop-up windows Although not always bad, bear in mind that pop-ups can be annoying. People tend to close pop-up windows before they have even finished downloading.

27 Don't open new windows for links to other websites There's always a temptation to open links to other websites as a new window by using target=new at the end of the link. Don't do it. As soon as you open a new window you break the back button. And nine times out of 10 it's the back button that people are going to use to return to your website. Naive users on small screens may not even realise a new window has been opened.

28 Don't break the back button Opening new windows is just one of several ways of impeding the effect of the back button. Use of tables or using an immediate redirect are two other ways. An immediate redirect means that every time the user clicks back the browser goes back to a page that bounces the user forward to somewhere else.

29 Think about splash screens Splash screen is the term for an initial screen that pops up before you get to the main menu page, rather like the front cover of a book. A splash screen on a search engine or a news portal just annoys users and sends them somewhere else. But there are websites where it might be appropriate - like the website for a poet, an artist or perhaps a club or society.

30 Avoid slow server-response times Your server or a connection to your back-end database server could be slowing things down for users. Most users don't know or care why your website is slow. They vote with their mice by clicking the back button. Consider increasing the RAM, adding more processor power, using load balancing or arranging to have your server mirrored in another location.

31 Check your bandwidth Bandwidth is another big factor in how fast your site appears to users. At about 60 per cent of bandwidth use you need to start thinking about getting a bigger pipe. At 80 per cent you've already left it too late and users are turning away from your site because they're sick of waiting for it to download.

32 Put your scripts in order Maybe you've got some CGI or JavaScript that you knocked together in a hurry. Tidying it up will bring performance dividends.

33 Include addresses, phone and fax numbers It's amazing how often you can't find these on a website. Not being able to find them is incredibly annoying because sometimes you do want to phone, write to or fax an individual or company responsible for the site you're visiting. Similarly, a website is an obvious place to include a map and details to enable clients, visitors and vendors to your office.

34 Smarten up your error messages There will always be error messages somewhere on your website, in particular the '404 error, file not found'. Take the trouble to create custom error pages. These will be consistent graphically with the rest of your site and suggest alternatives and likely explanations of the error.

35 Avoid moving pages to different URLs There's nothing more annoying for users than to bookmark an interesting article or piece of information and then return to find it's been moved.

36 Optimise your graphics You can use programs such as linkbot (see www.linkbot.com) to wander around your site and make graphics more compact using the correct web-friendly palettes. Linkbot is also a good way of hunting down broken links.

37 Set picture sizes Always set width and height attributes for pictures even if they're just small buttons or icons. Your pictures will still work if you don't, but your pages won't load as quickly.

38 Don't have spelling mistakes Sometimes people seem to think that, because web pages can be changed so easily, they don't have to apply the same rigorous standards that you'd apply to a printed publication. Wrong. Spelling mistakes jar just as much on a website as they do on paper.

39 Don't use anti-aliasing on small type Anti-aliasing is a technique to improve the way text looks. It gives the appearance of smoothing the shapes in graphics and type by inserting pixels of intermediate colours along the edges. Used on type, anti-aliasing removes the jagged edges of large font sizes. Image-editing programs such as Photoshop are used for anti-aliasing.

However, lots of people make the mistake of applying this to small type sizes. Type smaller than 10 point is actually harder to read when it has been anti-aliased.

40 Background colours reduce legibility Black text on a white background is the easiest text to read. Black text on a light grey background is still pretty legible, but other combinations are much harder for users to read. Sites such as www.simplyfood.co.uk achieve the best of both worlds. Its opening screen is very colourful, but longer sections of text that you need to read are styled for legibility



41 Use Includes One way of partially getting around the difficulty of changing the main template is to use SSI (Server Side Includes). This is a type of HTML comment that tells the web server to dynamically generate data for the web page whenever it is requested. The basic format is:

```
<!--#command tag="value"...>
```

where #command can be any of various commands supported by the web server. The simplest command is #include, which inserts the contents of another file. Includes are useful for ensuring that standard elements like menus and footers, are the same on all pages throughout a website. To change a standard element, you need only modify the include file, instead of updating every web page individually.

42 Get rid of table borders It's surprising how many websites still include visible borders on tables. This doesn't look very attractive. Get rid of them by setting `Border="0"` in your TABLE tags. Instead, use spacing, alignment and indents to make tables readable, not ugly borders.

Be discriminating in your use of coloured backgrounds – you want surfers to be able to read what's on the site



43 Don't use unnecessary HTML Part of the secret of keeping HTML lean and mean is to hand-code it. Using a decent editor such as Allaire Homesite (www.allaire.com) makes things much easier. If you must use code generators such as Microsoft Frontpage or Pagemill, at least learn to go through the code they create and clean up some of the redundant code that editors tend to leave in your documents. Even unnecessary single spaces and carriage returns bloat your HTML.



All unnecessary: Don't use HTML that isn't needed – editors such as Allaire Homesite can help cut down the code

44 Keep file names and directories short For example, if you call your invisible spacer GIFs (see tip 48) `singlepixel.gif` and use 20 of them throughout a page, the repeated name of the image alone will take up 300 bytes in your HTML. But if you name them `p.gif`, it adds up to only 100 bytes – a big saving. Use the same approach to shorten the names of your directories and reduce the number you use. If a reference to an image is `SRC="pcw_images/top50webtips/shortdirectories.gif"`, you're going to save a lot of bytes by using something like `SRC="images/shortdir.gif"`

45 Comment your HTML Properly commented code is much easier to understand when you go back and trawl through it a year later. `<!--Top navbar-->` will do fine, however, `<!--Top navigation bar-->` is over-egging the pudding and wasting bytes.

46 Minimise use of quotation marks. According to strict HTML standards, all attributes should appear within quotation marks. In fact, browsers usually don't need them to correctly interpret HTML. So instead of `` try ``

It works the same and saves a few bytes. There are some places where you do have to use quotation marks. For multiple words (as in `ALT="front cover"`); on values that begin with a plus sign (as in `SIZE="+2"`); hexadecimal values (as in `COLOR="#cc0033"`); and in URLs with slashes such as `SRC="images/shortdir.gif"`.

47 Use the short version of HTML commands There is still quite a lot of redundancy in HTML, which means there's often more than one way to achieve the same effect. Always use the shorter version of any commands. For example: Use `<CENTER>` instead of `<DIV ALIGN=center>` to centre something. Use `` instead of `` to embolden something. Use `<I>` instead of `` to achieve italic. Use `<BIG>` instead of `` to make text one size larger. Use `<SMALL>` instead of `` to make text one size smaller.

48 Indenting paragraph If you use cascading style sheets you can set the indentation of paragraphs using 'text-indent'. Using plain HTML you can just put a `<P>` at the end of each paragraph. Much better is to use a line break tag `
` followed by a transparent single-pixel GIF (`p.gif` – see tip 44 for why we've called it `p.gif` and not `singlepixel.gif`). This gives you more control over spacing and looks something like this: `
 `

49 There's a place for Flash Most users are now comfortable with downloading the Flash plug-in. You can create some great Flash animations and effects from surprisingly small files. But if you are using Flash, make sure you do a plain HTML version too.

50 KISS 'Keep it simple stupid' is well on the way to becoming an SOA (severely overused acronym), but with good reason. An over-abundance of features and clever effects make a website harder to use, and makes visitors more likely to click the back button.



Help the

DO YOU HAVE AN UP-TO-DATE PC? Chances are – unless you have money to upgrade regularly – you’re using a system that’s a couple of years old. And if you’re stuck on a system such as a 200MHz Pentium, you may well salivate at the thought of something much faster.

There are plenty of upgrades on offer from PC parts suppliers that can, apparently, breathe new life into your system. You could add a faster processor, more memory, better hard drives and end up with a PC the equal of the latest models.

That’s the theory, but in practice, it might be a false economy. Take, for instance, a PC based on a 166MHz MMX Pentium with 64MB of memory – enough for general use these days. To go to a really fast processor would require a new motherboard. With most new motherboards

being made for ATX-style cases, that means a new case too. And then new memory chips, since the old ones will not work on a new motherboard.

And here’s where it all starts to add up. In fact, if you have a really old machine, about the only thing worth considering is an overdrive type processor that fits in the existing motherboard, costing around £100-150. Spend much more than that, and you stumble into dangerous territory where there may be as little as £100 difference between upgrading an old system and buying a new one. While for some users, that difference may be crucial, for others it’s not – and remember that a new PC will come with a warranty, new software, faster hard drives, USB ports and, most likely, a better monitor than your old one.

In short, if you have anything that won’t take



ILLUSTRATION JONNY MENDELSSON

aged?

DON'T JUST CHUCK YOUR OLD PC OUT. YOU CAN TEACH AN OLD DOG SOME INTERESTING NEW TRICKS, SAYS NIGEL WHITFIELD.

the latest chips without a motherboard upgrade, it simply isn't worth spending money on it when new systems can be bought for less than £500.

Another thing to bear in mind is that if you buy a new PC, your old one will still be hanging around. And that's what we're interested in here. Just because a system is slow when you're running Office 2000 doesn't mean its only value is as an oversized doorstop. There are still plenty of ways to make use of older hardware.

Got a buddy?

If you have around £140 to spare on top of the cost of a new PC, one thing that's worth looking at is Buddy. This is an expansion card that fits in your new system, and links via a cable to a small control box.

It's not the same as re-using the whole of your

old computer – instead, you just plug the old keyboard, mouse and monitor into the control box and it gives you another terminal that lets two people use your new PC at the same time.

The technology isn't that new – it's been around for a while in the world of Unix systems – but on a home computer running Windows, it needs the fast processors that are used on the latest systems to provide two Windows desktops.

That said, your new PC – unless you're a heavy gamer – is spending most of its time twiddling its thumbs, waiting for you to press a key, so you'll find that using a sharing card such as this will provide two systems that have reasonable performance. This option will also allow you to transfer other parts of your old system, such as the hard drives or a CD-RW, into the new one.

But if you decide against transferring these



parts across, you could invest in a monitor and keyboard switch to put between the old monitor and the Buddy box. This will let you use the same screen either on your new system via the Buddy card, or on the old one. Switcher boxes start at around £30 for models with a mechanical switch. Alternatively you could opt for a unit such as the Belkin OmniCube that lets you switch the display from the keyboard.

Playing games

If your household or office has more than one up-to-date PC, capable of playing the latest multiplayer games, then you might consider keeping the old PC fully intact and using it as a server for networked play. Most PC games can be networked in one way or another and you'll be able to find out on the Internet whether or not



there are servers that you can download, and what they'll require in terms of hardware.

With Quake, for example, you can download servers from ID Software's pages at www.idsoftware.com/quakeworld – and the server simply needs a Windows 95 machine to run.

You'll also need, of course, a network card for each computer that you want to link up – but with cards costing £25 or less, that's not too much of a problem.

The old PC acting as a server will allow you to play multi-player games on your network without any of the clients being slowed down by having to handle all the network communication. If you connect to the Internet, though, there are a few reasons why you might want to use your own Quake server rather than one provided by your ISP. You can control all the settings on the server, such as the type of matches, or assign a password to restrict connections. And that means you and your friends can have a private game, without sharing the server with all the other users of your ISP.

Those with a very fast PC might not see much benefit in doing this – dumping some of the load from a 700MHz Pentium III onto an old P150 probably won't help things – but if you already have more than one computer and want to share games with lots of people, it's worth downloading the server for your favourite games and giving it a whirl to see what difference it makes.

Network-ready

Network cards aren't just used for games, of course. With the addition of a network card to your old and new PCs, you can link the two together using the standard file and print sharing in Windows.

For a home office, there are obvious advantages, allowing two people to work together and share information easily. That could mean allowing a machine in the kitchen to check your diary, if a call comes in late when you've shut the office door. Or investing in a full-blown multi-user accounts program.

There are other things you should consider, too. If you have a Windows printer, for example, you'll know that they can slow down a lot of the rest of the work you're doing, since they use the main processor to create the page that is to be printed. By networking two machines together you can leave your old PC to handle the printer, so that as soon as the job has been sent over the wire between them, you can switch back to your real work.

An old system could also be used as a backup server, either by adding a tape drive or just by using it to automatically back up your critical data onto its existing hard drive. There's no need to worry about floppy disks – you simply copy it all back from your old system should something go wrong.

Once your computers are networked, there are plenty of other things they can be used for. If the old system is running Windows 98 Second Edition, you can use the built-in Internet Connection Sharing facility. This lets you leave the modem on the old machine, but still access the Internet from the new one.

Why do this? Well, one advantage is extra security. If anyone does manage to attack the computer that's connected to the Internet – perhaps you forgot to set a password for file sharing – that's the only computer they'll reach. Your accounts and other important data can be stored safely on the new computer, away from prying eyes.

This isn't exclusive to Windows 98 SE. There are products, such as WinGate (www.wingate.com) which you can use to achieve the same result, using Windows 95 on your old PC. A version of WinGate that supports up to three users costs around £25, but you can download a trial version from the website as well.

Other systems

When it comes down to it, you probably decided to ditch your old system because it was slow. Slow running Windows.

But that doesn't mean it's unusable for other operating systems. Windows is a huge behemoth of an OS, and there are alternatives, such as Linux, that you can run on the same hardware, with much better performance.

For example, many people use ageing 486s running Linux as mail servers. As long as the

No such thing as a free computer?

If you're not tempted to re-use an old PC yourself, there are other options, besides leaving it out for the garbage collectors.

It may well be the case that the PC you're replacing is still fairly serviceable for business applications, even if it won't run the latest version of Office.

That doesn't matter to some organisations, especially in the voluntary sector, where massive software and hardware upgrades are seldom the norm. Some, you'll find, are still running systems based on DOS or Windows 3.1.

So, if you have no real use

for an old computer, donating it to a charity or voluntary organisation is one option that you can consider. Some of the smaller organisations in your area might be crying out for computer hardware so it might be worthwhile giving them a call to offer your PC to them.

If you do go down this route, however, you might have to do some work to prepare a system yourself – and remember to check the licences for any software you installed to see whether or not you can pass it on to someone else. You may simply have to reformat the

disk to ensure you're not unwittingly committing software piracy.

The simplest solution is to find an organisation that specialises in recycling computers for charity, and there are a number around the UK. Some sell the systems on to students or other people on low incomes. Others distribute them overseas, or to other charities. In all cases, though, they'll look after cleaning the system up and making sure it's only running licensed software.

You'll find some useful links to refurbishing computers on the DTI

website at www.dti.gov.uk/support/comp.htm. If you'd like to support education, www.free-computers.org is a charity that distributes old computers to schools, in association with the Rotary Club. WasteWatch, an environmental organisation at www.wastewatch.org.uk, has a list of recyclers and other information on its site, on the Electronic Equipment fact sheet.

Even if it turns out that your old PC can't be used or refurbished, by passing it on to one of these organisations, you can be sure it won't just end up in a landfill site.

computer has enough RAM, around 20MB, then it will be able to deliver thousands of email messages a day without needing a reboot for several months.

If you have at least 16MB of memory – although preferably more – and a couple of hundred megabytes of disk space, then you can run Linux on your PC. And you'll find downloadable software on the Internet for most of the things discussed here – connection sharing, mail servers, firewall and even games servers. Not only this, but it'll all perform much faster than under Windows.

You can even download graphical word processors for Linux, such as WordPerfect, but adding a graphical interface will slow things down. For the best performance, especially if you want to run a Linux system as a firewall or an Internet gateway, it's worth the time and effort learning how to control the OS from the command line. When things are set up properly, you really can leave it alone to do its job.

There's no doubt that Linux is the most versatile option for an older PC. SAMBA, for example, turns the system into a Windows-compatible file and print server, while Netatalk or CAP will allow it to serve files to Apple Macintosh systems.

Add a web cache such as squid, or CERN's proxy server, and you can route all your Internet

access through the Linux box, helping to make the most of your bandwidth with an intelligent local cache – a file where pages you frequently visit are held so that they don't have to be constantly downloaded from the Internet.

Best of all, Linux is 'free', although you can expect to pay around £40 for a copy in PC World, which is a lot less trouble than downloading it. Similarly, if you prefer to play with a commercial Unix, then why not order a free version of OpenServer or UnixWare from www.sco.com, for a similar price?

While upgrading an old PC is seldom cost-effective these days, that doesn't mean it has to be tossed into a landfill. As our suggestions show, there are still plenty of things you can do with it – even if it's an ancient 486. So, shake the piggy bank, and see how much it'll cost you to treat yourself to a new computer. When you consider the use you'll still be able to get out of the old one, you may find you have a real bargain on your hands.



CONTACTS

Belkin OmniCub monitor and keyboard switch costs £119.85 inc VAT, www.belkin.com 01604 678 300; PC World Buddy B-200 PC sharing system costs £139 inc VAT, buddy.direct2u.co.uk 0800 298 7178.

TOBY HOWARD INVESTIGATES A **BIOLOGICAL COMPUTER** THAT HAS ITS ROOTS IN 1935.

Test-tube Turing

IT WAS IN 1996 that Leonard Adleman, a computer scientist at the University of Southern California, devised a completely new kind of computer. As reported previously in *Futures* (December 1996), Adleman used DNA – the molecule of life – to compute a solution to a particular mathematical problem. His approach kick-started a brand new field of research: biological computation.

Adleman showed how it was possible to use specially-prepared pieces of DNA in a test-tube to encode the input data of a computation. He then left the molecules to their natural interactions, including linking up to form sequences of DNA – which could be chemically

decoded to give the result of the computation. In effect, because Adleman's 'computer' contained vast numbers of identical pieces of DNA, it was performing a million million calculations in parallel.

Although Adleman's technique is revolutionary, it turns out to be suitable only for a few limited types of problem. However, a new approach has been pioneered by Professor Ehud

Shapiro of the Weizmann Institute of Science (www.wisdom.weizmann.ac.il/people/%7Eeudi). Shapiro has found a way to use DNA as a truly general-purpose computer, suitable for solving any kind of problem.

The idea is to use DNA to operate as a 'Turing Machine'. This hypothetical computer design was devised by the British mathematician Alan Turing in 1935 (www.turing.org.uk). Turing's machine is a computer, boiled down to the barest of essentials. It consists of an infinitely long tape, that passes through a read/write head. The head can read back a symbol stored on the tape, or write a symbol to the tape. At any time, the machine is in a certain state, and it uses the symbol it reads from the tape and a set of

internal rules (its 'program') to change its state. This might involve winding the tape forwards or backwards a number of symbols, or rewriting the symbols on the tape, and so on.

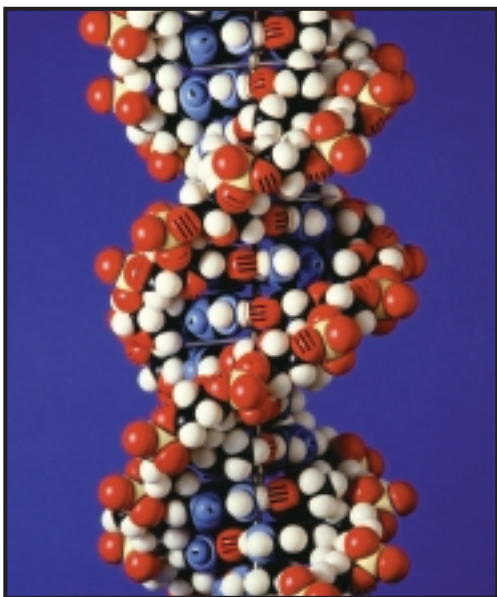
To start the machine, you load the tape up with symbols and start the program. When the machine halts, the symbols remaining on the tape are the solution to the problem. If you want to see what a Turing machine looks like in action, try one of the various Java simulation applets on the web, such as Suzanne Britton's, at www.dcs.warwick.ac.uk/~pwg/tm.html.

Of course, Turing never meant for his machine to actually be built – it's just a mathematical model of the fundamentals of computing: reading data, making decisions, and writing data. But Professor Shapiro is proposing that a real Turing machine can be efficiently built using the biochemistry of living cells.

Shapiro's machine will exist in a sea of organic molecules in a test-tube. The tape will be made from a huge polymer of linked-up molecules – where each individual molecule represents a symbol on the tape. The read/write head will be a kind of molecular 'reaction vessel', that fits over the part of the polymer corresponding to the current symbol being processed. The overall state of the machine will be encoded by 'transition' molecules, which bind to the current symbol molecule. There'll be a unique transition molecule for every possible state the machine can be in. As for programming the 'machine', this will be done by determining the possible chemical reactions between transition molecule and symbol pairings.

Like Turing's original machine, Shapiro's – for now at least – remains theoretical. But he's confident that, given time, the biochemists will really be able to build it: 'Logically, the device is not more complicated than the biomolecular machines of the living cell,' he said.

If the Shapiro machine could ever be made to work, its implications would be astounding. A cell could be programmed to monitor its environment for abnormalities and synthesise and dispense the appropriate drugs. Such cells could be sent off around the body as trouble-shooters, checking that organs are working properly, sending back data or doing on-the-spot repairs. You could theoretically have a computer in every cell of your body, and no-one would ever know.



Using Alan Turing's methodology, Shapiro believes that DNA could be programmed to solve specific computational questions

TOBY HOWARD LOOKS AT THE EXCITING POSSIBILITIES OF A NEW FORM OF CARBON.

Carbon updating

A NEWLY-DISCOVERED FORM of carbon is sending waves through the research community. As well as the prospect of cheap, super-thin, high-quality display screens, this new kind of carbon – the nanotube – has unusual properties, which may lead to huge advances in computer memory technology and chip design.

Carbon is certainly strange stuff. In its graphite form it is soft and smudgy, but as diamond it is the hardest substance known on earth. Its peculiar chemical properties make it the basis for life. If this weren't enough of a repertoire for a single element, in the early 1990s a new class of carbon molecules was discovered: the fullerenes.

Named after Buckminster Fuller, inventor of the geodesic dome, fullerenes are complexes of carbon atoms arranged into regular geometric shapes.

Perhaps the best-known fullerene is the 'buckyball', comprising 60 carbon atoms arranged in the shape of a football (or more accurately, a regular truncated icosahedron).

Amazingly, this is the shape assumed by some carbon atoms in an ordinary candle flame.

A related fullerene is the nanotube, first discovered in soot deposits in 1991 by Sumio Iijima of Japan's NEC Corporation. A nanotube is made of millions of carbon atoms, arranged into a long thin hollow cylinder, just a few atoms in circumference. Effectively, a nanotube is a sheet of graphite one atom thick, rolled up into a cylinder. And nanotubes have some very interesting properties.

Their electrical conductivity, for example, enables them to be used as wires on the quantum scale. Such wires would be almost unimaginably small, even by the standards of silicon chips. Sufficiently long nanotubes could be used to effectively connect the quantum world to our macroscopic world, enabling, for example, the control of machines made from molecules.

And it's the electrical behaviour of nanotubes that makes them suitable for building a new kind of flat-screen display called the 'field-emission display' or FED. Conventional liquid-crystal displays are certainly flat, but they also have a number of drawbacks – such as poor image quality, a restricted field of view and high cost. FED technology addresses all of these problems.

In principle, FEDs work in the same way as conventional cathode-ray tubes (CRTs). A grid of coloured phosphor dots emit light when stimulated by an electron beam. In the conventional CRT, there's a single source of electrons – the electron gun – whose aim is scanned across the screen. But in order for the gun to have enough room to 'see' the whole area of the screen, it needs to be mounted far enough away – hence the very obvious non-flatness of CRTs.

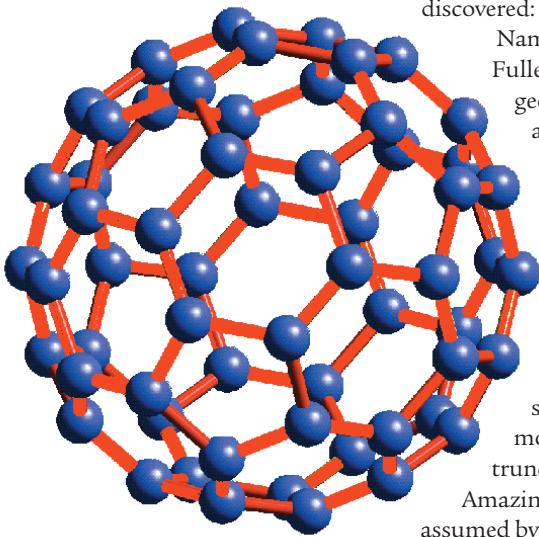
An FED, however, doesn't have a single electron gun. Instead, every pixel in the display has its own private gun, mounted just behind it. An electric field applied to the screen pulls electrons out of the guns. The design calls for the tiny guns to have sharply-pointed tips, so they emit coherent, focused streams of electrons. It turns out that nanotubes are perfect for this.

The main difficulty of fabrication is to grow an array of nanotubes on a glass substrate, making sure they're all perfectly aligned in the array, and all pointing perfectly forwards. Recently, researchers at Samsung's Korean labs demonstrated a working prototype, and several other Japanese companies are known to be working on the technology – in secret.

Another application of nanotubes is to make computer memory. Place a buckyball inside a nanotube whose ends have been sealed, apply an external electric field and – hey presto – you have a memory cell. The polarity of the field can be used to push the buckyball to either end of the nanotube, and the two positions can be used to represent a 1 and a 0 (www.pa.msu.edu/cmp/csc/memory.html).

Researchers at Delft University of Technology have also used nanotubes to create single-molecule transistors, which could be used for building logic gates (vortex.tn.tudelft.nl).

Nanotubes may only be visible through an electron microscope, but we're sure to be seeing a lot of them in the future.



The Buckyball is the best-known fullerene and is made up of 60 carbon atoms. Its shape can often be found in ordinary carbon atoms in a candle's flame

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book

nirvana

If you're one of those people who spends half their **life on the go**, the chances are you'll have given serious thought to getting a notebook. And whether it's the power of desktop-replacement models or the portability of ultra-slim machines you're looking for, we've got something for you.

When you buy a desktop system, you're pretty certain what you're going to get. You can configure the system yourself, specify most of the components if you so wish – and if you find you've left something out six months down the line, then it's simply a matter of purchasing the part you want and plugging it in. Notebooks, however, are a completely different kettle of fish. In order to keep the size down and the battery life up, certain sacrifices have to be made. The main problem is that each manufacturer has a different view of what should be saved and what should be cut. The result is that the notebook market is awash with lots of different designs.

To make the job easier we split this group test into two sections: fully-featured and ultra-portable. In the fully-featured section we were looking for a mobile Pentium III processor, at least 64MB of RAM, minimum 13.3in screen and at least a 6GB hard drive. For the ultra-portable section only two things mattered, the machine had to be slim and it had to be sexy – performance was less of an issue. We invited 18 manufacturers to submit machines in either section; read on to find out what the best mobile solution is for you.

ratings

★★★★★	EXCELLENT
★★★★	VERY GOOD
★★★	AVERAGE
★★	BELOW AVERAGE
★	POOR

PHOTOGRAPHY: DAVID WHITE

ACi Aspect

FULLY-FEATURED



THE ASPECT HAS A LOT in common with AJP's entrant. It is cheaper though, and has a more intelligent choice of processor – a mobile Pentium III 500MHz – as opposed to AJP's 550MHz Flip Chip. It has the same amount of memory, at 128MB. The fact that there is a mobile rather than a Flip Chip in it means that you get all the benefits of lower power consumption and lower heat levels. It also means that it can run

more quietly, as the fan does not need to run as fast or as often. A generous 12GB IBM Travelmate hard drive is supplied which should see most users through the demands of everyday use. A DVD is also present – and this should play movies with the supplied Cinemaster player, as well as read any DVD software you may buy. There's also a modem port for connecting to the Internet when you're on the move.

The screen is fairly average. We thought it was a bit dull when compared to some of the best TFTs here, but the focus is sharp. There are small dark patches in the corners, depending on which angle you tilt the screen. The native resolution is a healthy 1,024 x 768. It will be adequate for most people, but there are better examples here.

The keyboard is fairly good, but again, there are better examples in this section. The keys travel further than some of the other models, but we found them to be a bit too hard and inflexible to be comfortable for long periods. The touchpad is positioned slightly left of centre. This gives you

more room to rest your right hand when typing, which we found comfortable, but will affect different people in different ways depending on your typing style.

A floppy drive is in a bay to the left, ensuring that everything's at your fingertips all the time. Next to this is one Type III and two Type II PC Card slots. There are also two USB ports, and even a full-size FireWire port at the rear. Unusually, where there should have been an infrared port, the slot was covered with a piece of plastic.

The Aspect isn't a bad model for the price, but it doesn't win any awards against this level of competition.

DETAILS

PRICE £1,850.63 (£1,575 ex VAT)

CONTACT ACi 020 8830 1958

www.aciplc.com

PROS DVD included, mobile Pentium III, lower price than AJP's, FireWire port

CONS Display not the best here, no infrared

OVERALL Not the best, but for the money not a bad effort

BUILD QUALITY	★★★★
PERFORMANCE	★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★

AJP 3300CDF

FULLY-FEATURED



THE AJP 3300CDF looks rather similar to the ACi Aspect above, although there are a couple of differences. Rather than opt for the more expensive mobile processor, AJP has decided to use a full-size Pentium III Flip Chip clocked to 550MHz. There's also 128MB of RAM as standard, helping it to achieve a score of 107 with SYSmark 2000.

The chassis is 32.2cm wide by 26cm deep with a height of 4.5cm. These

dimensions mean that a reasonable keyboard has been incorporated into the body, the only major problem being the position of the 'Fn' key where you would expect to find 'Ctrl', which can become infuriating after extended use. To guide the pointer around the screen, there is a touchpad situated below the spacebar.

On the left-hand side of the machine is space for one Type III or two Type II PC Cards, as well as the floppy drive and the heat outlet for the processor. On the opposite side is the DVD-ROM, headphone, mic and line in sockets, modem connector and a blanking plate where we assume the IrDA lens

should be.

At the rear of the unit, you'll find two USB, one PS/2, a docking connector, one serial, one parallel, one D-SUB and an S-Video connector. The front of the machine is completely barren of ports and lights.

The 14.1in TFT screen can be pushed up to a maximum resolution of 1,024 x 768 and provides a reasonable image. Unfortunately, the lid seemed a little

fragile and adjusting the screen caused visible rippling due to the flexing of the TFT panel.

The use of the Flip Chip instead of a mobile processor meant that the 550MHz chip produced a fair amount of heat. Most of this was exhausted through the grate on the left-hand side of the machine, but the keyboard did become noticeably hot to the touch after only a short period of use. The fan was also quite noisy and noticeable even with office background noise. The use of the Flip Chip should have saved some money but it was hard to see where this saving has gone.

DETAILS

PRICE £1,895.28 (£1,613 ex VAT)

CONTACT AJP 020 8208 9777

www.ajp.co.uk

PROS DVD-ROM

CONS Non-mobile CPU, produced a fair amount of heat

OVERALL Using a standard CPU produces more heat and drains more power; there are better machines available in this test

BUILD QUALITY	★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★

Dell Inspiron 7500

FULLY-FEATURED



THE INSPIRON 7500 has taken the term desktop replacement very seriously. The unit is huge and we'd pity anyone who had to carry it with them for any length of time. That said, the screen is fantastic. At 15.4in this Dell has the largest display of all the notebooks on test. However, it's not just the physical size of the screen that's impressive, the resolution is also a cut above the rest. The highest resolution that any of the other notebooks offer is 1,024 x 768,

even the ones with 15in screens. But the Inspiron 7500 will happily display an image at 1,280 x 1,024, giving you far more desktop real estate. Unfortunately, when the machine arrived, Dell had set the resolution to 1,024 x 768, making the display look blurred and fuzzy because of the anti-aliasing employed when dropping the resolution. This is quite disappointing since many users may not even realise that the machine is running below par. Only the blurred text made us aware that the Inspiron was not running at its optimum resolution.

Beating at the heart of the Inspiron is a 500MHz Pentium III backed up by 128MB of RAM. The hard disk is a substantial 18GB, but the 7500 has another trick up its sleeve. The expansion bay at the front of the unit will accept EIDE devices when the notebook is connected to the mains, and a unit this size will almost always be running off AC power. This means you can put any capacity EIDE hard disk in the 7500.

Also situated at the front is a combined DVD and floppy drive. This

combination unit is easily accommodated by the thick chassis.

Although the quality of the screen is second to none, the other ergonomic qualities leave a little to be desired. The thick chassis puts your hands at an awkward angle when you're typing and the keyboard feels almost too large. Also, the keyboard is fairly insubstantial compared to some of the other units on test. Thankfully, the touchpad is very good and it's placed far enough away from the space bar to avoid inadvertent text selection.

The Inspiron 7500 comes close to being the ultimate desktop replacement, but ergonomic issues get in the way.

DETAILS

PRICE £2,231.32 (£1,899 ex VAT)

CONTACT Dell 0870 152 4850

www.dell.co.uk

PROS Huge, high-resolution screen, 3.5in drive bay

CONS It's massive and heavy, poor keyboard

OVERALL It's big and heavy, but if screen size is paramount it's worth considering

BUILD QUALITY	★★★★
PERFORMANCE	★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★

Evesham Micros Voyager 6000

FULLY-FEATURED



THIS IS THE FIRST of the notebooks to feature the new Intel SpeedStep processor, and it turns in a pretty-impressive performance. It achieved exactly the same SYSmark 2000 score as the Gateway Solo 9300LS, but has more memory at 128MB compared to the latter's 96MB. It has a 6.4GB hard drive, which is fairly standard in this company. It is the cheapest SpeedStep model here, and isn't bad for the money, but unfortunately it does have a few

serious failings. The screen, for one, is not the best. On the positive side, it has a native resolution of 1,024 x 768. However, it is fairly dim compared to some of its competitors, and this put a bit of a strain on our eyes after looking at it for a long period of time.

The keyboard is a good size and very similar in layout to a standard desktop QWERTY keyboard. The keys themselves are fairly responsive, but the supporting base moves every time one is pressed, giving a disconcerting impression of instability. The touchpad is as responsive as any of the others here, but the selector

buttons are a bit of a pain to use. They have to travel further than others before they make contact, meaning that you have to give each one quite a shove before it does anything, and this becomes quite tiring.

The rest of the notebook is better designed. A Toshiba DVD sits in a bay to the right, together with a li-ion battery that can be easily removed by undoing a catch. The battery has a set of four LEDs on it, which illuminate when a button is

pressed to give you a visual indication of how much charge is remaining. A floppy drive resides on the left together with one Type III and two Type II PC Card slots, a modem port and an S-Video out port. Graphics are supplied by an 8MB ATi Rage Mobility chip. A fold-away flap at the rear covers the D-SUB, parallel, serial and docking station ports. This also houses the PS/2, single USB and two audio ports.

Overall this is not a bad notebook by any means, but the quality of the screen, keyboard and selector buttons detract from what would otherwise be an excellent purchase.

DETAILS

PRICE £1,996.33 (£1,699 ex VAT)

CONTACT Evesham Micros 0800 038 0800

www.evesham.com

PROS Fast processor, loads of memory, DVD included

CONS Keyboard, selector buttons and display could be better

OVERALL A good price to pay for the latest processor, but not the best built unit here

BUILD QUALITY	★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★



Fujitsu Siemens Lifebook E-6530

FULLY-FEATURED



THE MOBILE PENTIUM III 500MHz processor inside this notebook, combined with 64MB of RAM, produced the slowest SYSmark score of the fully-featured machines tested. This aside, however, the Lifebook is a well-built unit with some unusual features. The 14in display is a bright, clear TFT model, with no dead pixels evident in our review model. The touchpad is comfortable and responsive to use, with rounded buttons that are easy to reach and press. Fujitsu Siemens hasn't

managed to fit both floppy and CD-ROM into the thin case, but you can swap them about and use the floppy simultaneously via the supplied cable. A cover is provided for the floppy, so it doesn't have to sit there in all its naked glory. One slightly irritating point is that you can't attach the CD-ROM using the same cable if the floppy is in the drive bay.

The Lifebook's most important differentiating feature is its security. The machine came with a shortcut on the desktop to set up the system security. You choose a five-figure number from a combination of numbers from one to four. Once this is set up, you can't turn on your system without entering the correct code into the keypad at the front: it won't even get to the BIOS screen. If you forget your number, though, you have to send it back for repair. The hard drive is not encrypted, however, which means that someone could potentially remove your hard drive and access your data without knowing the code.

The standard array of ports is present, including two Type II PC Card

slots and a docking station port. The audio ports are handily located at the front together with a volume slider that allows you to adjust the internal speaker volume without entering Windows. The bundled software is Microsoft Word 2000 and Intel's LAN Desk Manager for the optional docking station. Home users may prefer a fully-featured office suite, but the corporate clients that this unit is aimed at are likely to want to install their own software.

Overall, this is a very good notebook that is designed well for its target corporate market, but there are slightly better deals here.

DETAILS

PRICE £2,579.13 (£2,195 ex VAT)

CONTACT Fujitsu Siemens
01344 475 555 www.fjcomp.com

PROS Good extra security feature, good screen

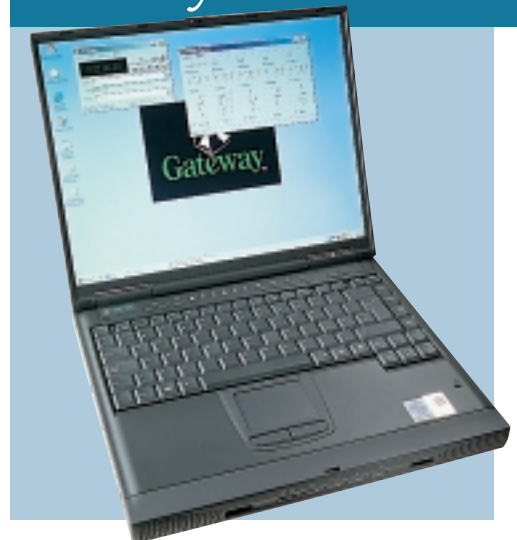
CONS Hard drive not encrypted, only 64MB of RAM makes it slower than others

OVERALL A good desktop replacement with more security than most, but a bit pricey for the basic hardware spec

BUILD QUALITY	★★★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★★

Gateway Solo 9300 LS

FULLY-FEATURED



THIS ENTRY FROM GATEWAY is fantastic value and would make an excellent buy for those who are looking for power, but are on a budget. It has a couple of faults, but for the price it really can't be criticised.

The Solo is the second notebook in this test to have the new Intel SpeedStep processor, and this one runs at the same speed as Evesham's: 600MHz. It has less memory, though, at 96MB. A 12GB hard disk is a fairly large drive for a

notebook, but given the sort of features it boasts, you'll need this and more.

The Solo is certainly packed with an excellent array of features that make it a desirable product. Starting with the basics, the 15in screen is very good – bright, clear, with no dead pixels and an adequate plastic bezel. The fact that the bezel is comparatively thin makes the display look slightly larger than others in this test.

The keyboard is well laid out and is close to full size. You can type on it fairly quickly and accurately, but some of the keys were not as responsive as we

would have liked and felt a little loose. The touchpad is easy to use and the selector buttons are responsive. Gateway has dotted several shortcut buttons around the unit. Volume up and down and mute buttons sit on one side of a row of indicator lights. There are also shortcuts to your email program, help files and your web browser, all of which can be configured.

At the front there are four controls for DVD or audio CD-ROM. The

DVD-ROM drive and floppy are mounted next to each other on the left-hand side of the unit.

The real bonus in this system is the fact that you can do basic video-editing, using the supplied ATi Mobility graphics chip with 8MB of memory. There are composite video in and out ports, but if you've got a DV camcorder you can use the FireWire port. There's even an optical digital out port for digital sound mastering. There's a modem port and two USB connectors on the right-hand side. If you can live with the 3.5kg weight, this is a great machine.



DETAILS

PRICE £2,407.58 (£2,049.58 ex VAT)

CONTACT Gateway 0800 55 2000
www.gateway.com/uk

PROS Fast processor, large hard drive and good screen

CONS Keyboard could be slightly better, quite heavy

OVERALL An excellent desktop replacement that's brilliant value for money

BUILD QUALITY	★★★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★★

Hi-Grade Notino AS7400-500

FULLY-FEATURED



THE NOTINO AS7400 is based on a mobile Pentium III running at 500MHz, with 128MB of RAM. In terms of performance, the Hi-Grade was near the top of the group – beaten only by the SpeedStep machines.

The 14.1in screen can stretch to a maximum resolution of 1,024 x 768, with the graphics processing provided by ATI's Rage Pro chipset. The screen itself was not the best in the group test and it wasn't possible to position it

so that the brightness was even across the whole display. The screen was darker at the top and lighter at the bottom. The keyboard provides most keys directly with only a few needing the 'Fn' modifier and the layout is sensible. To move the pointer around the screen, a touchpad is provided below the keyboard. Unfortunately, the pad is a little too close to the spacebar, resulting in occasional cursor relocation.

As the AS7400 was entered into the fully-featured category it was not the most petite on trial, at 2in high. The flip-down back panel has a useful sliding cover over the docking connector, so the whole panel doesn't have to be opened when docking. The rear IrDA lens is also visible without having to remove the back panel. Under the cover you'll find a joystick port, D-SUB video out, one USB, one network connector, one serial, one parallel, one PS/2 and an S-Video connector. One the right-hand side of the machine you'll find the DVD-ROM drive and battery bay, while on the left there is one Type III or two Type II PC Card slots, standard audio connectors,

a volume control, floppy drive and the internal hard-drive bay. Somewhat alarmingly it was possible to remove the drive easily while the computer was running. Closer examination revealed that the mechanism to secure the drive was not present on the review unit we were supplied. The internal battery is somewhat harder to remove, however, featuring a locking mechanism inside the compartment that must be released. At the front of the unit you'll find a second IrDA port, which is thoughtful, and the on/off switch.

The AS7400-500 is generally a good machine, but the lack of hard-disk lock on our model was a serious oversight.

DETAILS

PRICE £2,066.82 (£1,759 ex VAT)

CONTACT Hi-Grade 020 8532 6100

www.higrade.com

PROS Good performance, good keyboard

CONS Uneven brightness on screen, no lock on internal hard drive on review unit

OVERALL The Notino AS7400-500 is a decent machine, but a lack of attention to detail has let it down

BUILD QUALITY	★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

HP Omnibook 4150B

FULLY-FEATURED



THIS IS ONE OF THE FIRST notebooks to feature Intel's new SpeedStep system, and it's a fantastic application of an excellent technology. This allows the 650MHz processor to run at two different clock speeds, depending on whether the unit is plugged into the mains or not. You can set how you want the processor to behave in the BIOS, and there's also a handy SpeedStep tab under power management that allows you to turn the

feature on or off, and will also warn you when the performance is about to be changed. There's 128MB of memory fitted as standard on this high-end model. There's also a massive 17GB hard disk drive that helps to make this machine viable as a genuine desktop replacement.

Build quality is excellent. HP has built both a trackpoint and a touchpad into the unit, and two sets of selector buttons are positioned above and below the touchpad. This means that there's quite a lot of empty space underneath the keyboard, but it also provides a handy rest for your hands. The keyboard is generally well laid out, with our only small complaint being that the Return key is smaller than the Shift key below it, meaning that it's a bit too easy to press Shift instead of Enter.

The 14.1in TFT screen is excellent. At its native resolution of 1,024 x 768 it is bright and clear, and no dead pixels were evident. If you put the resolution any lower, it displays the image in a smaller window on the screen that ensures that all of the images and text stay in proportion. There are two bays located

at the front of the notebook – one for the li-ion battery and one drive bay. Our unit came with a DVD drive that did not combine well with the supplied MPEG2 decoder software, producing a poor performance when watching movies. If you want to use the DVD and floppy at the same time, you'll need to buy a separate cable at a cost of £10. Around the chassis you'll find one Type III or two Type II PC Card slots, a PS/2 port, USB, infrared, serial, parallel, D-SUB and a docking station port.

Unfortunately, the biggest drawback is its high cost. If you can afford it though, you'll be buying a cutting-edge mobile machine.

DETAILS

PRICE £3,536.75 (£3,010 ex VAT)

CONTACT Hewlett-Packard 0990 47 47 47 www.hp.co.uk

PROS The fastest machine here, good screen and keyboard

CONS Price, you have to buy a cable for simultaneous floppy and DVD

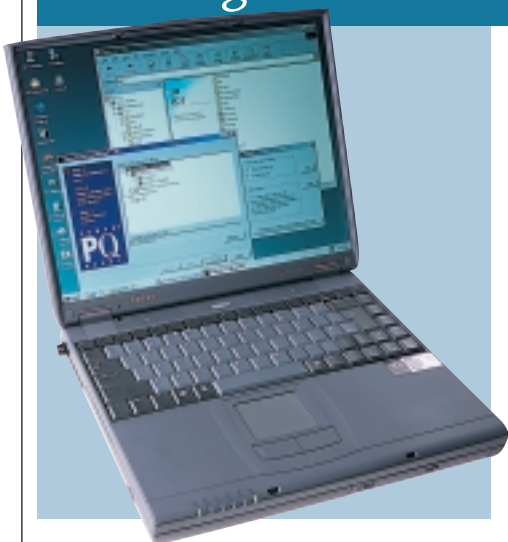
OVERALL An excellent desktop replacement if you can afford it

BUILD QUALITY	★★★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★



Samsung GT7000XV

FULLY-FEATURED



THE SAMSUNG GT7000 is built around Intel's mobile Pentium III processor running at 500MHz, with 128MB of SDRAM sitting in one of the two available SODIMM sockets. This specification helped the Samsung achieve a reasonable score of 108 in our SYSmark 2000 tests.

In terms of usability, the keyboard layout was good, with the most commonly used keys in sensible places. The only major problem was the rather

large Caps Lock key, that meant it was easy to slip into capitals accidentally. The pointing device takes the form of a touchpad that was accurate and easy to use, with taps and double taps being accurately interpreted. The position of the touchpad was far enough from the keyboard and suitable recessed, so that any unintentional use while typing was unlikely.

The 15in TFT screen supports a native resolution of 1,024 x 768 which is fairly standard for a display of this size. Unfortunately, we were unable to position the screen so that the brightness was even across the whole display. As a result the screen tended to be darker at the top and brighter at the bottom.

The internal hard drive provides 9GB of storage and there is a standard non-removable floppy drive on the left of the chassis. The front houses a bay that was occupied by a CD-ROM in our review machine (although the system will ship with a DVD-ROM). An LS-120, ZIP or second hard drive are all available as options. Two Type II PC Cards or one Type III can be accommodated at any

one time, while at the rear of the machine you'll find one PS/2 port, an S-Video-out connector and power in. Under a drop-down flap there is one D-SUB video, one serial, one parallel and a docking bay connector. There is also a discreet slide cover for the docking connector, so it can be accessed without having to open the whole flap. The left side of the machine plays host to the modem connector, two USB ports, mic, headphones and line in as well as an IrDA port.

The Samsung is a decent enough fully-featured notebook, but the slightly disappointing screen and comparatively slow processor make it look a little under-specified in its present company.

DETAILS

PRICE £2,936 (£2,499 ex VAT)

CONTACT Samsung
020 8391 0168

www.samsungelectronics.co.uk

PROS Multi-function bay, 128MB RAM

CONS Uneven brightness on screen

OVERALL A good contender, but there are better machines in the test

BUILD QUALITY	★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Sony Vaio PCG-F309

FULLY-FEATURED



SONY'S ENTRY INTO THE fully-featured category may not be as sexy as its ultra-portable 505SN, but it's still a very desirable product. This really is a fully-featured notebook in every sense of the word. The first thing that strikes you about the F309 is the massive 15in TFT screen. This is one of the best notebook displays we have ever seen, with incredibly even lighting across its surface and bright and vibrant colour. With a display like this you'd have no problem

using the F309 as your primary machine for extended periods of time. Driving this superb screen is a 2.5MB NeoMagic graphics chipset, that will give you a maximum resolution of 1,280 x 1,024 on an external monitor, albeit with 256 colours.

The rest of the specification is also high-end, with a 500MHz Pentium III CPU backed up by 128MB of SDRAM. With a spec like this the F309 can do anything that a desktop machine can, although to be honest it has one up on most desktops – digital video-editing facilities. From launch, Sony has included a FireWire or IEEE1394 port on its

notebooks. This means that digital video can be transferred to the notebook still in its digital format for editing – and then shipped back to DV tape with no loss of quality. Although mobile digital video-editing is a niche market, it's good to have the option and Sony has installed a 12GB hard disk to make the idea seem even more viable.

The keyboard is exceptional, the keys are full size and the feel is very solid and responsive. Likewise the touchpad is

very high quality making any type of input a breeze.

Both the floppy drive and the DVD-ROM drive are internally mounted in the chassis so there's no need to swap between peripherals. There's a full array of ports around the casing including IR, audio, FireWire, two USB, PS/2 and one Type III or two Type II PC Card slots.

Inside the box you'll also find a 56K PC Card modem and a video-output cable, in case you want to watch DVDs on your TV.

On the whole the PCG-F309 is a great fully-featured notebook, it may not be as fast as the 650MHz HP, but it's beautifully built and can be used for digital video-editing.

DETAILS

PRICE £3,300.57 (£2,809 ex VAT)

CONTACT Sony 0990 424 424

www.sony.co.uk

PROS Great build quality, feature-packed

CONS Relatively expensive

OVERALL A very impressive fully-featured notebook, but the Gateway offers better value for money

BUILD QUALITY	★★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★★

Acer TravelMate 342T

ULTRA-PORTABLE



The display itself is adequate, but compared to others here it is slightly dull with poorer focus. The keyboard is very well laid out. Acer has made the most of the space with most of the keys placed in similar positions to a standard keyboard to help you find your way around it. The touchpad is large enough to use comfortably and is responsive to the touch, while the selector buttons are easy to reach. Between the left and right buttons, Acer has squeezed a small rocker that, when each end is pressed, enables you to scroll through the open window as if using a wheelmouse.

THIS NIFTY LITTLE MODEL from Acer is a good compromise between portability and power. It's the only ultra-portable to have a mobile Pentium III processor in it, and the 500MHz of power ensures that it comes top of the SYSmark 2000 table. It has 64MB of RAM and a 9GB hard disk – enough for a model in this section.

The 12.1in screen only manages 800 x 600 before going to a virtual desktop, but for most users this will be sufficient.

The ports are well laid out, with the majority located at the rear of the unit. The standard D-SUB, serial, and parallel ports are grouped together with the PS/2, infrared and USB next to them. Acer has managed to squeeze in both a Lucent Winmodem and an Intel network adaptor, with ports next to each other at the rear. This will be a welcome feature for many users, especially as there are no drives inside. Drives are catered for by a large, heavy box – that you connect

using the supplied captive cable to a port on the left-hand side of the notebook. The floppy is at the top of the unit, with the CD-ROM underneath. We found this a bit tricky to connect, but once you've arrived wherever you're going, it's good to only have one box cluttering up your desk rather than two. The weight of the drives may put you off carrying them around, however. This model also comes with a USB video camera that clips on to the side of the screen for video-conferencing.

Considering the processor speed, the price represents good value for money, making this well-designed notebook an attractive option.



DETAILS

PRICE £2,172.58 (£1,849 ex VAT)

CONTACT Acer 01753 487 000

www.acer.co.uk

PROS Fast processor, large hard drive, good layout and build quality

CONS Combined floppy and CD-ROM is bulky and heavy

OVERALL It's not quite as small as some others here, but it's still an excellent buy

BUILD QUALITY	★★★★
PERFORMANCE	★★★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★★

ACi Concept

ULTRA-PORTABLE



drive attaching via a cable at the rear. Around the back of the unit there's also a PS/2 port to connect an external mouse or keyboard.

A flap on the left flips down to reveal a D-SUB video out, serial and parallel port. On the right-hand side of the machine there is the DVD-ROM, IrDA lens, recessed 'paper clip' reset switch and volume control.

On the opposite side of the machine is one USB port, modem connector and a single Type II PC Card slot. On the front of the chassis are headphone and mic sockets for easy access.

ACi'S SECOND OFFERING falls into the ultra-portable section of the group test. The Concept features a mobile Pentium II processor running at 366MHz and 128MB of RAM. These factors helped it achieve a SYSmark 2000 score of 69, putting it behind only the Hi-Grade and Acer.

The machine weighs in at 2.12kg and its physical dimensions are 27.4 x 23 x 4cm. Housed in the main unit you'll find a four-speed DVD-ROM, with the floppy

To navigate your way around Windows, there is a touchpad situated below the keyboard, although it was slightly off-centre and closer to the left-hand side. The keyboard itself was fair, given the overall size of the machine. Unfortunately, ACi has chosen to place the 'Fn' key where you would expect to find 'Ctrl', which is used far more than the 'Fn' key. Consequently, if you use a lot of keyboard shortcuts, you'll have to retrain to use this machine. The space

bar was also a little small and it was all too easy to strike the keys next to it by mistake.

The 12.1in TFT screen will display a resolution up to 800 x 600 pixels and brightness was consistent and even across its display. Feeding the screen is a Trident Cyber 9525 chipset with 2.5MB of RAM.

On the whole, the ACi scored well on performance, mainly due to its 128MB of RAM. The keyboard could be improved upon and the screen resolution could be higher. Also, at £1,682 ex VAT, it's more expensive than smaller and lighter machines from Sony and Toshiba.

DETAILS

PRICE £1,977.37 (£1,682.87 ex VAT)

CONTACT ACi 020 8830 1958

www.aciplc.com

PROS DVD-ROM, 128MB of RAM

CONS Keyboard layout awkward in places.

OVERALL A reasonable machine, but more expensive than the superior competition.

BUILD QUALITY	★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★

Compaq Armada M300

ULTRA-PORTABLE



may seem a little under-powered by today's standards, notching up only 56 points on our SYSmark 2000 test, but the focus of this machine is portability not power and it is well suited to this. In order to keep the size down, only the necessary components are housed in the case, with other peripherals relegated to the supplied docking station that neatly attaches to the bottom of the machine.

On the main unit itself you'll find an 11.3in TFT screen – capable of displaying a maximum resolution of 800 x 600, powered by an ATi Rage LT Pro chipset with 4MB of memory. The back

THE ARMADA M300 is targeted firmly at the business market and as a result comes with Windows NT pre-installed. Power management is controlled by Compaq's own Control panel applet, so you shouldn't come across any problems on that front, although Windows 98 is probably the more sensible solution for the home user.

The Armada M300 uses Intel's Mobile Pentium II processor running at 333MHz with 64MB of SDRAM. This

of the chassis is shielded by a circular battery that folds down to act as a support and reveals the rear ports. On the back you'll find one D-SUB video, one serial, one parallel, one USB and an IrDA port. On the right-hand side you'll find a modem port and one Type II PC Card slot, with the docking slot located on the base. When the unit is docked you'll find two PS/2 ports, one D-SUB, one serial, one parallel, one USB and a further docking station connector. The

docking station also houses the floppy and CD-ROM, both of which can be attached to the main unit via a supplied lead if you need them when you're on the move.

Despite the small size, the keyboard is very easy to use. The keys have been arranged in such a way that few keys have been moved to irregular positions. The touchpad below the keyboard was accurate and suitably recessed, so as to avoid accidental use while typing.

When detached from the docking station, the unit was light and should prove no problem to carry around. On the whole the Compaq is a decent ultra-portable and worth a look if you don't mind the slow performance.

DETAILS

PRICE £2,107.95 (£1,794 ex VAT)

CONTACT Compaq 0845 270 4000

www.compaq.co.uk

PROS Small in size, detachable floppy and CD-ROM docking station

CONS Not the fastest in the test

OVERALL A good machine that should satisfy the mobile user

BUILD QUALITY	★★★★
PERFORMANCE	★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Elonex Piranha

ULTRA-PORTABLE



for light use, but isn't the best we've seen in the test – and may start to grate after prolonged use. It manages an impressive 1,024 x 768 resolution, but doesn't have a very uniform luminescence. The bezel is slightly larger on the right-hand side than the left, which makes the display look strange at first – but once we had got over the initial surprise we didn't notice it much.

Moving the screen also causes a few ripples, which can be a bit disconcerting. One patch at the bottom left of the display on our review model continued to ripple for 15 seconds on average after movement, which was a little worrying.

The keyboard is firm and responsive. We found it easy to type on, with most of the keys placed in sensible places. The touchpad and selector buttons are similarly easy to use. The left selector button is shaped to be slightly larger than the right, making it easier to press with the thumb when typing.

All the standard ports are here

IN MANY RESPECTS, compared to some of the other models here, the Elonex doesn't cut the mustard. When you take into consideration the fact that it is the cheapest model in the test, however, it doesn't seem all that bad. Elonex has built a notebook based on a 466MHz mobile Celeron and 64MB of memory. This gives it a large performance boost, coming fourth in the SYSmark 2000 league table. The 4.8GB hard disk is on the small side compared to others here, but considering the price this isn't a tragedy. The 11.5in TFT screen will be adequate

including a useful internal modem at the rear. A hinged cover protects the serial, D-SUB and parallel ports from the wear and tear of the outside world. To its left is an infrared and PS/2 port.

There's also one Type II PC Card slot for attaching external devices. The separate floppy and CD-ROM drives are plugged into two specially-designed ports behind a cover on the right-hand side. This allows you to use the floppy and CD-ROM simultaneously.

Overall, the Piranha is not the best here, but if you can't afford to go for one of the more expensive models, you could do a lot worse.

DETAILS

PRICE £1,233.75 (£1,050 ex VAT)

CONTACT Elonex 0800 037 4466

www.elonex.co.uk

PROS Low cost, relatively high performance

CONS Display could be better

OVERALL Excellent value for money, but we'd recommend spending a bit more cash

BUILD QUALITY	★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★

Fujitsu Siemens Lifebook B-2130

ULTRA-PORTABLE



is situated in the normal position on the keyboard. Although the touch-sensitive layer does increase the reflectivity of the screen compared to a normal TFT, the advantages that it offers far outweigh this, and the reflectivity should only become a problem if a light source is positioned directly behind you.

The ability to 'point' directly at what you want using the touch screen is far easier than guiding a pointer. There were a couple of problems associated with it – the accuracy can be a little off, even after calibration, and it

THE LIFEBOOK USES a 400MHz mobile Celeron processor coupled with 64MB of RAM. The SYSmark score of 61 is reasonable, but not as fast as the 400MHz Pentium II machine.

The 10.5in screen can manage a resolution of 800 x 600, powered by a NeoMagic MagicGraph 128 display controller. Situated on the left of the screen is a small stylus, which is used to operate the touch screen. This can be used in addition to the trackpoint, that

doesn't appear to work with a virtual desktop. Setting the resolution to 1,024 x 768 and scrolling the screen confuses the pointer, even after recalibration. That said, it's unlikely that the display panel will be used on this setting for an extended period of time.

The keyboard is soft, with a very short travel and this could become an issue with extended use. The 'Fn' key has also been placed where you expect to find 'Ctrl' which is annoying.

All the sockets around the edge are protected by rubber bungs when not in use, although not all of the bungs are attached to the main body and could get lost. The rear of the machine offers an expansion port that connects to the supplied port replicator, offering two PS/2, one serial, one parallel and the floppy drive connector. On the right you'll find two USB, one D-SUB, mic, headphones and a volume control. Finally, on the left there's a modem, network port, custom serial port, one Type II PC Card slot and an IrDA lens.

Overall, this is good product, sporting some great features. If you can live with the keyboard, it's worth a look.

DETAILS

PRICE £1,821.25 (£1,550 ex VAT)

CONTACT Fujitsu Siemens 01344 475 555

www.fujitsu-siemens.co.uk

PROS Touch screen, small in size

CONS Not the best keyboard layout or construction

OVERALL A well-designed ultra-portable that should satisfy the occasional mobile user

BUILD QUALITY	★★★★
PERFORMANCE	★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Hi-Grade UltiNote AS8300-400

ULTRA-PORTABLE



ask yourself is whether you need an internal CD-ROM drive while you're on the move.

Powering the AS8300 is a mobile Pentium II running at 400MHz. Hi-Grade has backed up the processor with 96MB of RAM, making the base specification fairly impressive for a slimline machine. Storage shouldn't be a problem, with a 12GB hard disk to keep all your data on.

Build quality is fairly solid, although the keyboard is a little light and springy. Also, the Return key is smaller than it should be, making typing a little difficult at first.

The touchpad is high quality and pointer manipulation is a breeze.

Unfortunately it's a little bit too close to the space bar, resulting in inadvertent cursor relocation while typing. This problem is compounded by the fact that the utility to disable the touchpad's tapping feature was not loaded on our review machine.

The 13.3in screen is quite large for an ultra-portable and it can comfortably manage a resolution of 1,024 x 768. The quality of the display is good with even lighting across the surface.

There's a dual external bay supplied

with the unit. This can hold two devices, such as a floppy and a CD-ROM. The unit also has CD player controls on the top, along with an LCD display, basically turning it into a CD audio player. The bay also contains VGA, serial and parallel ports, which would be useful if these connectors weren't already present on the notebook itself. One major string to its bow is the inclusion of a modem and a network adaptor. A single connector underneath the infrared port accepts the supplied splitter with modem and network connections.

Ultimately, the AS8300 has some good features, but it's not really an ultra-portable in the true sense of the word.

HI-GRADE'S ENTRY into the ultra-portable category is a debatable one. Although it is smaller than all the fully-featured notebooks on test, it's not particularly slim when compared to some of its svelte competition. The AS8300 is considerably larger than the Sony 505SN and is over twice as heavy, weighing in at 2.48kg. That said, the AS8300 does have an internal CD-ROM drive, that adds to its weight and dimensions. The question you have to

DETAILS

PRICE £1,726 (£1,469 ex VAT)

CONTACT Hi-Grade 020 8532 6100

www.higrade.com

PROS Large screen, quite fast

CONS Large, poor keyboard, touchpad utility not loaded

OVERALL A fair machine that's not quite small and light enough to suit the true mobile user

BUILD QUALITY	★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★

Panasonic Toughbook CF-37VB-62AH

ULTRA-PORTABLE



ALTHOUGH IT DOESN'T quite match the great heights of the Sony, Panasonic's entry in the ultra-portable section is still an excellent machine. At only 2.5cm thick, it's amazing that the company has managed to squeeze a CD-ROM drive into the case. However, there's also a 120MB Superdisk thrown into the bargain.

The 12.25in screen unfortunately only goes up to an 800 x 600 resolution, but this is still adequate for everyday use. The display is very easy to look at,

and is bright and clear enough to read for long periods without getting tired eyes. Unusually, the screen is a touch screen, which makes using the Toughbook much easier if you don't like using a touchpad all the time. A stylus that doubles as a biro is supplied to use the screen. This capability makes it slightly more reflective than others in this test, but we felt this was an acceptable compromise for this feature. The keyboard is fairly compact and takes a bit of getting used to, but after a bit of practice it's easy to use – with the keys being responsive enough to type at fast speeds. The touchpad is large

enough to be comfortable and the mouse keys are placed in sensible positions to maximise ease of use. Panasonic has also included a handy screen-flipping utility. This, combined with the fact that the screen folds flat, makes the Toughbook a good proposition for those who need to perform one-to-one presentations regularly. The machine arrived with Windows 95 installed, a factor that might appeal to corporate users who want to minimise the mix of operating

systems they have in the company. This might not be so appealing, however, for consumers.

One interesting power-saving feature is the fact that the Toughbook automatically dims the screen when the mains cable is unplugged. Unfortunately, despite the fact that this is a relatively new product, its basic hardware specs are not so impressive. A mobile Celeron 366 and 64MB of memory are adequate enough, but if you're after a bit more power, there are plenty of better options here. That said, it's a very impressive piece of kit, especially if you need to use an internal CD-ROM.

DETAILS

PRICE £2,592.62 (£2,199 ex VAT)

CONTACT Panasonic 0344 853 948

www.panasonic.co.uk

PROS Touch screen, internal CD-ROM

CONS Windows 95 might be a turn-off for some users, mobile Celeron outclassed by mobile Pentium II

OVERALL A good piece of kit, but a little outclassed by other models

BUILD QUALITY	★★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★★

Rock Pegasus

ULTRA-PORTABLE



ALTHOUGH IT DOES HAVE a few points in its favour, this ultra-portable is unfortunately not among the best here. One of those good points is that it is small – at only 27cm wide and 3cm high. It also has a dedicated button for putting the unit into standby, to make this function easy to perform. The screen achieves a good resolution for its size, managing 1,024 x 768.

The bad points outweigh the good, however. Pressing the plastic surround causes the screen to flex alarmingly. After being turned on for some time, the

left-hand side of the display began to flicker. The screen does not tilt as far back as some other models, which also annoyed us.

Apart from the screen, the power button next to the standby button turns the system off with one touch – it does not put it through any kind of shutdown procedure. This makes it a little too easy to lose some important work by accident.

The fact that the unit is so small means that Rock

has had no choice but to make the keyboard more compact than others. There is nothing wrong with this in itself, but this keyboard doesn't make for a pleasant typing experience. You have to hit the keys fairly hard to make them work, and we found the spacebar to be too small for extended fast typing. The touchpad is fine, though.

A mobile Celeron running at 400MHz forms the backbone of this system, which produces below-average performance. As far as memory is concerned, 96MB of RAM is included –

an unusual figure, but it is better than some of the other 64MB offerings here. A 6.4GB hard drive is fairly standard for slimline notebooks. There are no drive bays – to use a floppy or CD-ROM you have to use the supplied cables, again par for the course.

On the back of the notebook there are single D-SUB, parallel and serial ports. The right-hand side has the bonus of a modem port, a single PS/2, a USB and audio ports. There is one Type II PC Card slot to the left.

Even taking the Rock's comparatively low price point into account, it's still outclassed by the better specified competition.

DETAILS

PRICE £1,350.08 (£1,149 ex VAT)

CONTACT Rock 0870 720 2000

www.rock-computers.co.uk

PROS Easy-to-use standby button, fairly compact

CONS Keyboard, screen

OVERALL Simply outclassed in this company

BUILD QUALITY	★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★
OVERALL RATING	★★★

Sharp PCA280

ULTRA-PORTABLE



supplied as standard, so connecting up to external drives can be a bit cumbersome. To provide a full keyboard, a number of keys have had to be relocated, and as a result typing is far from intuitive. The function keys along the top row are half height, which is acceptable since they are not used that frequently. Not so acceptable is the

THE SHARP PCA280 is built around a Pentium II Mobile processor clocked to 366MHz, coupled with 64MB of RAM. It managed a SYSmark 2000 score of 65, and given that the main focus of the machine is portability and not power, this is reasonable.

In terms of size, the Sharp gives the Sony and Compaq machines a run for their money, although the Sony 505SN is thinner. On the downside, you won't find any drive bays in the machine body itself. The CD-ROM and floppy drives are supplied as separate units, and these attach via a PC Card and a right-hand expansion port, respectively. Unfortunately, no docking station is

positioning of the cursor keys, arranged in a rotated 'L' configuration, resulting in 'Left' being pressed when you intend to press 'Down'. 'Home', 'End', 'Page Up' and 'Page Down' have also been relegated to secondary positions which require the 'Function' modifier to utilise them. On the whole, the keyboard seemed cramped and mistypes may become annoying after extended use. A small touchpad is provided to guide the pointer around the screen, and this is situated below the keyboard.

The 11.5in screen supports a native resolution of 800 x 600 pixels, which is adequate for a machine of this size. Brightness was even across the display,

with colours presented accurately. The 8GB hard disk is more than acceptable for a unit of this size.

All ports are suitably protected by rubber bungs, which are thoughtfully secured to the main body. At the rear is a standard D-SUB connector as well as a network port and docking station connector. The right side of machine plays host to a modem port, external drive connector, mic, headphones, USB port and IrDA. On the opposite side you'll find a second USB port, power connector and one Type II PC Card slot.

Sharp has produced a good machine, but it's eclipsed by the cheaper and more powerful Sony.

DETAILS

PRICE £1,991.63 (£1,695 ex VAT)

CONTACT Sharp 0800 262 958

www.sharp.co.uk

PROS Small and light with good screen

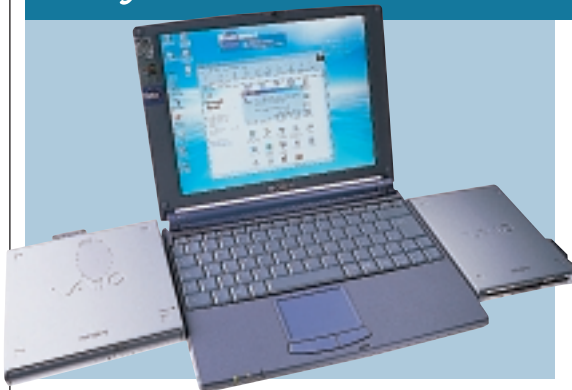
CONS Extended use of keyboard could be infuriating

OVERALL A good little machine, but the keyboard let it down

BUILD QUALITY	★★★★
PERFORMANCE	★★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Sony Vaio PCG-505SN

ULTRA-PORTABLE



previous models. The CPU is backed up with 64MB of RAM, which is adequate, but falls short of the 96 or 128MB of RAM seen in other models on test. However, as Intel's SpeedStep Pentium III CPUs go to show, most users aren't bothered about raw power while they're on the move, so the target audience for the 505 will be more than happy

IT COULD BE SAID that Sony invented the ultra-portable market when it first introduced the Vaio 505G back in 1997. Ever since that launch, the 505 range of portable computers have been the object of desire for almost anyone who has to work on the move.

This latest addition to the 505 series marks a considerable step forward. Initially Sony thought that it wouldn't be possible to fit a Pentium II CPU into the slim form factor, but the Japanese giant seems to have overcome this problem. The 505SN sports a 400MHz mobile Pentium II, complete with 256KB of full-speed Level 2 cache. This gives it a considerable performance boost over

with the performance.

The physical appearance of the unit is much like the previous 505X model, including the stunning 10.4in TFT screen that sports an impressive 1,024 x 768 resolution. The screen is driven by a 128bit NeoMagic graphics chipset with 2.5MB of video memory.

Despite its svelte dimensions, the 505SN has a very usable keyboard. The keys are a fair size and well spaced, while the travel and break allow for a solid typing experience. The large touchpad is equally impressive, with a very responsive action that makes pointer manipulation simple.

In the box you'll find a PC Card

CD-ROM that exhibits Sony's usual superb design – when not in use the cable wraps around the side of the unit and the PC Card clips into a recess in the base of the drive.

There's also an external USB floppy drive, with similarly well-designed cable storage. Finally, there's a port replicator with parallel, serial, VGA, USB and FireWire ports. The lack of PS/2 indicates that Sony expects you to use a USB keyboard and mouse.

The notebook itself sports PC Card, infrared, FireWire, USB, power and audio connectors.

Not only is the 505SN a fabulous machine, the price of £1,449 ex VAT makes it excellent value as well.



DETAILS

PRICE £1,702.57 (£1,449 ex VAT)

CONTACT Sony 0990 424 424

www.sony.co.uk

PROS Small and light, great build quality

CONS None

OVERALL The original and still the best ultra-portable money can buy

BUILD QUALITY	★★★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★★★★
OVERALL RATING	★★★★★

Toshiba Portégé 3110CT

ULTRA-PORTABLE



64MB of RAM and a 6.4GB hard disk. Although this spec is far from power packed, it's still good enough for most mobile-computing tasks. For the true mobile user size and weight are more important than raw power.

The only area where the Portégé really falls down is the screen. Although the screen size is the same as the Sony 505, it can only manage a resolution of 800 x 600 as opposed to 1,024 x 768. Even

TOSHIBA HAS BEEN making high-quality notebooks for some time now and it's quite fair to say that along with Sharp, it's one of the only companies that's giving Sony a true run for its money in the design stakes.

The Portégé is a beautifully-designed product, resplendent in its silver magnesium casing, much like a Sony Vaio 505SN. It's slim and desirable and weighs in at a lithe 1.42kg. That said it's still larger than the Sony and heavier by just over 200g.

Beneath the Portégé's sleek exterior is an Intel Pentium II, running at 300MHz. The CPU is backed up by

though 800 x 600 should be fine for most of the applications that are used on a machine like this, it's still a bit of a shame that it can't display XGA. Screen graphics are driven by a Trident chipset that is equipped with 2.5MB of video memory.

The keyboard feels a little flat, more like a good PDA than a notebook, although it's easy to type on once you get used to it. Pointer manipulation is handled by a trackpoint that performs admirably, while the two selection buttons are easy to activate with your thumb.

Bundled with the Portégé are an

external floppy drive and a 24-speed CD-ROM drive – the latter of which connects via the single Type II PC Card slot. There's also a built-in V.90 modem to keep you in touch while you're on the move.

Around the chassis there are ports for infrared, USB, audio and the port replicator. The latter adds VGA, parallel, serial, PS/2 and an RJ45 network port, making this machine fairly well-connected for its size.

The Portégé 3110CT is a great ultra-portable notebook, let down slightly by its screen and dated processor. That said, it's slim and sexy and costs around the same as the Sony.

DETAILS

PRICE £1,756.62 (£1,495 ex VAT)

CONTACT Toshiba 01932 828828

www.toshiba.co.uk

PROS Small, light and well built

CONS Slow processor and low-resolution screen

OVERALL A beautiful ultra-portable notebook, although the Sony has more to offer

BUILD QUALITY	★★★★
PERFORMANCE	★★
VALUE FOR MONEY	★★★★
OVERALL RATING	★★★★

Twinhead PowerSlim 600

ULTRA-PORTABLE



respectable SYSmark score of 64.

The 12.1in TFT screen is well focused and features even lighting across the whole surface. What is a little disappointing, though, is the resolution. Given that the screen is larger than that of the Sony 505SN, a resolution of 1,024 x 768 would have been preferable to the achieved 800 x 600. The Trident graphics chipset will allow the resolution to be pushed up to 1,024 x 768, but only in a virtual desktop environment.

The 6.4GB hard disk is fairly standard for an ultra-portable model, although considering that the Twinhead is not as slim as some, we'd have liked to have seen a larger disk included.

The keyboard is fairly easy to type on and has a decent amount of springback. Twinhead has also managed to keep the cursor keys in their correct configuration, which is a small, but important, point. The touchpad is quite close to the space bar, but we didn't experience any accidental activation. Even so, it's still a shame that the utility to disable touchpad tapping had not been loaded. The touchpad itself was

EVER SINCE SONY and Siemens started producing notebooks in magnesium cases, every other notebook manufacturer has decided that silver is the best colour for its machine. Following suit, Twinhead has opted for a matt silver finish on the PowerSlim 600.

Beating at the heart of the Twinhead notebook is a 366MHz mobile Pentium II, backed up by 64MB of memory. This is a fairly conservative specification, although the PowerSlim still managed a

very responsive and it is easy to move the cursor to the desired location.

On the right of the chassis is a bay that can accommodate either the supplied CD-ROM or floppy drive. You can also install a second battery into the bay for extended mobile use.

There's also an external case for the floppy drive, so it can be used while the CD-ROM is installed.

On the left of the case is a single Type II PC Card slot, a USB port and the connector for the internal 56K modem. While at the rear are PS/2, parallel, serial and VGA ports.

The Twinhead is a reasonable unit, but considering that it's larger, heavier and more expensive than the Sony 505SN, it's hard to recommend it.

DETAILS

PRICE £2,100.90 (£1,788 ex VAT)

CONTACT Twinhead 0161 877 6787

www.twinhead.co.uk

PROS Internal CD-ROM/floppy bay

CONS Expensive, low screen resolution

OVERALL A reasonable notebook with an unrealistic price

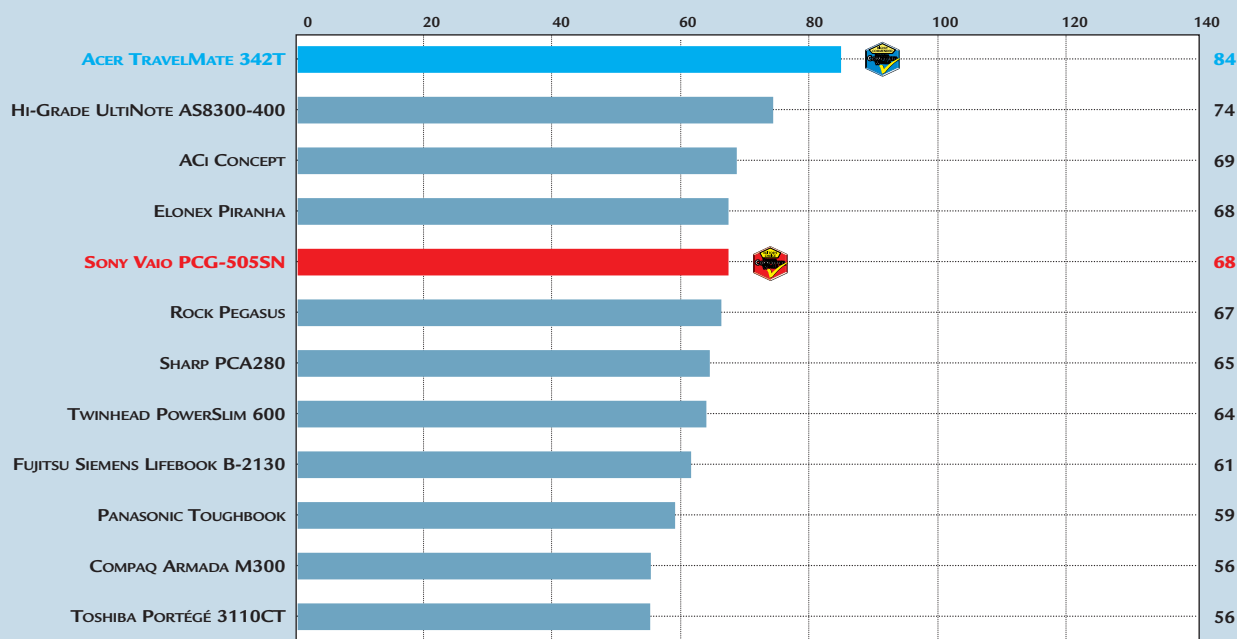
BUILD QUALITY	★★★
PERFORMANCE	★★★★
VALUE FOR MONEY	★★
OVERALL RATING	★★★



SYSmark 2000 fully-featured notebooks



SYSmark 2000 ultra-portable notebooks



How we did the tests



■ **SYSmark 2000** contains 12 application workloads and a workload-manager application that is responsible for setting up the workloads, timing their execution, and reporting performance results. Each SYSmark 2000 workload consists of a real application (Adobe Photoshop, for example) and a test script that sends commands to the application.

■ **Workloads**

The applications include Microsoft Excel 2000,

CorelDRAW 9, Dragon Systems NaturallySpeaking Preferred 4.0, Netscape Communicator 4.61, Corel Paradox 9, Microsoft PowerPoint 2000, Microsoft Word 2000, MetaCreations Bryce 4, Avid Elastic Reality 3.1, Adobe Photoshop 5.5, Adobe Premiere 5.1 and Microsoft Windows Media Encoder 4.0.

After SYSmark 2000 is run on a system at a resolution of 1,024 x 768 in 16bit colour, it assigns an overall performance rating. This is based on a comparison of

workload run-times, between the system being tested and a fixed calibration platform. A rating of 100 indicates the test system has performance equal to that of the calibration platform, 200 indicates twice the performance, and so on. The calibration platform is based on a Pentium III 450MHz processor, an Intel 440BX chipset motherboard, 128MB of SDRAM, a 32MB Diamond Viper V770 Ultra, an IBM DJNA 37 1800 hard drive and Windows 98 SE.



Table of features	FULLY FEATURED									
	ACI	AJP	DELL	EVESHAM MICROS	FUJITSU SIEMENS	GATEWAY	HI-GRADE	HEWLETT-PACKARD	SAMSUNG	SONY
MODEL	ASPECT	AJP	INSPIRON	VOYAGER	LIFEBOOK	SOLO	NOTINO	OMNIBOOK	GT7000XV	VAIO
		3300CDF	7500	6000	E-6530	9300 LS	AS7400-500	4150B		PCG-F309
Price ex VAT	£1,575	£1,613	£1,899	£1,699	£2,195	£2,049	£1,759	£3,010	£2,499	£2,809
Telephone	020 8830 1958	020 8208 9777	0870 152 4850	0800 038 0800	01344 475555	0800 55 2000	020 8532 6100	0990 47 47 47	020 8391 0168	0990 424 424
0161 877 6787										
Dimensions (cm) (wxdxh)	31.6x25.6x5	32.2x26x4.5	33x28.5x6	310x258x39.5	308x260x37	32.2x26.4x4.1	33.2x25.7x5.3	32x25.5x4	32.4x25.7x4.2	32.25x26.5x4.5
Weight with battery (kg)	3.22	3	4.4	3.2	2.7	3.52	3.6	3.08	3.19	3.38
Standard warranty	None	1yr RTB	1yr C&R	2yrs + ADI	3yrs	1yr RTB	1yr RTB	1yr RTB	1 yr RTB	1yr C&R
International warranty	Optional	✓	Optional	RTB	✓	✓	✗	✗	Europe only	✗
HARDWARE										
Processor	Mobile PIII 500	PIII 550	Mobile PIII	Mobile PIII 600	Mobile PIII 500	Mobile PIII 600	Mobile PIII 500	Mobile PIII 650	Mobile PIII 500	Mobile PIII 500
Mobile P II 366		(FPGA)	500MHz	SpeedStep		SpeedStep		SpeedStep		
Memory fitted (MB)/type	128/SDRAM	128/SDRAM	128/SDRAM	128/SDRAM	64/SDRAM	96/SDRAM	128/SDRAM	128/SDRAM	128/SDRAM	128/SDRAM
Max memory	256MB	256MB	512MB	576MB	256MB	288 MB	320MB	256MB	256MB	256MB
Hard disk manufacturer and model	IBM Travelmate	Toshiba MK1214GAP	IBM DARA 218000	Fujitsu MHH2054AT	Fujitsu	IBM EIDE 9.5m N-7863	IBM Travelstar	IBM Travelstar	IBM Travelstar	IBM Travelstar
Capacity	12GB	12GB	18GB	6.4GB	10GB	12GB	18GB	17.2GB	9GB	12GB
CD/DVD manufacturer and model	Torisan DVD DRDU625	Torisan DVD DRD-U624	Toshiba DVD SD-C2302	Toshiba DVD	Fujitsu CDS-1 CD/Internal	Torisan DVD	Toshiba DVD SD-C2202	Toshiba DVD	Toshiba DVD	Toshiba DVD SD-C2202
Internal or external Interface	Int	Int	Int	Int	Int	Int	Int	Int	Int	Int
Internal or external floppy	Int	Int	Int	Int	Int	Int	Int	Ext if DVD in use	Int	Int
Simultaneous floppy and CD?	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓
No of PC Card slots/type	2 Type II/ 1 Type III	2 Type II/ 1 Type III	2 Type II/ 1 Type III	2 Type II/ 1 Type III	2 Type II/ 1 Type III	2 Type II/ 1 Type III	2 Type II/ 1 Type III	2 Type II/ 1 Type III	2 Type II/ 1 Type III	2 Type II/ 1 Type III
Modem type	PC Card	Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal	PC Card
Battery technology	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion
Trackpoint/touchpad	Touch	Touch	Touch	Touch	Touch	Touch	Touch	Both	Touch	Touch
DISPLAY										
Type/ Size (in)	TFT/14.1	TFT/14.1	TFT/15.5	TFT/14.1	TFT/14.1	TFT/15	TFT/14.25	TFT/14.1	TFT/15	TFT/15
Max internal resolution	1,024x768	1,024x768	1,280x1,024	1,024x768	1,024x768	1,024x768	1,024x768	1,024x768	1,024x768	1,024x768
Graphics chipset	ATi Rage LT Pro	ATi Rage LT Pro	ATi Rage Mobility	ATi Rage LT Pro	ATi Rage Mobility	ATi Mobility Pro	ATi Rage LT Pro	ATi Rage Mobility	ATi Rage LT Pro	NeoMagic Magicmedia
Video memory	8MB	8MB	8MB	8MB	4MB	8MB	8MB	8MB	8MB	2.5MB
PORTS										
No VGA/PS2/infrared	1/1/0	1/1/0	1/1/1	1/1/01	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1
USB/IEEE 1394	✓/✓	✓/✗	✓/✗	✓/✗	✓/✗	✓/✓	✓/✗	✓/✗	✓/✗	✓/✓
Serial/parallel/docking station	1/1/0	1/1/0	1/1/1	1/1/01	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1
Other	None	S-Video	None	S-Video	Network	Composite	None	None	S-Video	None
SOUND										
Sound chipset	ESS Maestro 2E	ESS Maestro	ESS Maestro 2	Crystal PNP	ESS Maestro	ESS Maestro	ESS Maestro	ESS Maestro	ESS Maestro	Yamaha DS-Xg
Internal speakers/mic	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
External speaker/mic sockets	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
POWER MANAGEMENT										
ACPI/APM compliant	✓/✓	✓/✓	✓/✓	✓/✓	✗/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
Suspend to RAM/disk	✓/✓	✓/✓	✗/✓	✓/✓	✓/✗	✗/✗	✓/✓	✓/✗	✓/✓	✓/✓
Auto suspend/hibernate	✗	✓	✓	✓	✓	✗	✓	LCD Suspend	LCD Suspend	✗
SOFTWARE										
Operating system	Win98 SE	Win98 SE	Win98 SE	Win98SE	Win98 SE	Win98 SE	Win98	Win8 SE	Win98 SE	Win98 SE
Bundled software	None	None	MS WS99 McAfee VS	Lotus SS Power DVD 2.5	Word 2000 LAN Desk Mgr	MS WS99	Lotus SS IBM VIA Voice	None	Norton AV Adobe Acrobat	Video capture Picture Gear

KEY: RTB = return to base; C&R = collect and return; ADI = accidental damage insurance; ✓ = yes; ✗ = no; MS WS99 = Microsoft Works Suite 99; MS WS2000 = Microsoft Works Suite 2000; Lotus SS = Lotus SmartSuite; McAfee VS = McAfee VirusScan; NS = Not supplied at the time of going to press



ULTRA PORTABLE



ACER	ACI	COMPAQ	ELONEX	FUJITSU SIEMENS	HI-GRADE	PANASONIC	ROCK COMPUTERS	SHARP	SONY	TOSHIBA	TWINHEAD
TRAVELMATE	CONCEPT	ARMADA	PIRANHA	LIFEBOOK	ULTI NOTE	TOUGHBOOK	PEGASUS	PCA280	VAIO	PORTÉGE	POWERSLIM
342T		M300		B-2130	AS8300	CF-37VB			PCG-505SN	3110CT	600
£1,849	£1,682.87	£1,794	£1,050	£1,550	£1,469	£2,199	£1,149	£1,695	£1,449	£1,495	£1,788
01753 487000	020 8830 1958	0845 270 4000	0800 037 4466	01344 475 555	020 8532 6100	01344 853 948	0870 720 2000	0800 262 958	0990 424 424	01932 828 828	
29x22x2.5	27.4x23x4	26.5x22.9x2.3	27.8x21.9x2.78	24.7x19.6x2.5	28.5x23.6x3.1	30.2x24x3.5	27x22x3	26.3x21.1x2.3	26x21x2	26x22.7x3	27x22x2.5
1.9	2.12	1.5	1.6	1.42	2.3	2.12	1.82	1.41	1.2	1.42	1.67
1yr C&R	1yr RTB	1yr	1yr RTB	3yrs	1yr RTB	3yrs RTB; yr1 ADI	1yr C&R	3yrs	1yr C&R	1yr RTB	1yr RTB
✓	Optional	✓	Specified areas	✓	✗	✓	✗	✓	✗	✓	✓
Mobile PIII 500	Mobile PII 366	Mobile PII 333	Mobile Celeron 366	Mobile Celeron 400	Mobile PII 400	Mobile Celeron 366	Mobile Celeron 400	Mobile PII 366	Mobile PII 400	Mobile PII 300	
64/SDRAM	128/SDRAM	64/SDRAM	64/SDRAM	64/SDRAM	96/SDRAM	64/SDRAM	96/SDRAM	64/SDRAM	64/SDRAM	64/SDRAM	64/SDRAM
256MB	192MB	128MB	96MB	192MB	160MB	192MB	64MB	128MB	128MB	128 MB	192MB
IBM Travelstar	Toshiba	IBM	Fujitsu MHE2048AT	Fujitsu MHH2064AT	Fujitsu MHK2120AT	Toshiba MK6411	NS	Toshiba MK8113MAT	Toshiba MK601	Toshiba	Hitachi DK239A-65
9GB	6.4GB	6.4GB	4.8 GB	6GB	12GB	6.4GB	6.4GB	8.1GB	6.4GB	6GB	6.4GB
Teac CD	Toshiba DVD SD-C2202	Compaq CD	Fujitsu	Optional CD	Teac CD 224E	Panasonic CD UJDA140	Rock CD	Sharp CD CE- CD01 (£170)	Sony DVD PCEA-CD51	Toshiba CD	Toshiba CD
Ext/CD port	Int	Ext/PC Card	Ext/CD port	Ext/PC Card	Int	Int	Ext/ D port	Ext/PC Card	Ext/PC Card	Ext PC Card	Int or Ext
Ext	Ext	Ext	Ext	Ext	Ext	Int LS-120	Ext	Ext	Ext USB	Ext	Int or ext
✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
1 Type II	1 Type II	1 Type II	1 Type II	1 Type II	1 Type II	1 Type II	1 Type II	1 Type II	1 Type II	1 Type II	1 Type II
Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal	Internal	PC Card	Internal	Internal
Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion	Lithium-ion
Touch	Touch	Touch	Touch	Track	Touch	Touch	Touch	Touch	Touch	Track	Touch
TFT/12.1	TFT/12.1	TFT/11.3	TFT/11.3	TFT/10.5	TFT/13.3	TFT/12.25	TFT/11.3	TFT/11.5	TFT/10.5	TFT/10.25	TFT/12.1
800x600	800x600	800x600	1,024x768	800x600	1,024x768	800x600	1,024x768	800x600	1,024x768	800x600	800x600
Cyber 9525DVD	Trident Cyber 9525 DVD	ATI RAGE LT Pro	Silicon Motion SM710	NeoMagic MagicGraph	Silicon Motion Lynx EM	Silicon Motion Lynx EM4	SMI 710	Trident Cyber9525	NeoMagic MagicMedia	Trident Cyber9525	Trident
2.5MB	2.5MB	4MB	2MB	2MB	4MB	4MB	4MB	2.5MB	2MB	2.5MB	2.5MB
1/1/1	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1	1/1/1
✓/✗	✓/✗	✓/✗	✓/✗	✓/✗	✓/✗	✓/✗	✓/✗	✓/✗	✓/✓	✓/✗	✓/✗
1/1/0	1/1/0	1/1/1	1/1/0	1/1/1	1/1/1	1/1/0	1/1/0	1/1/0	1/1/1	1/1/1	1/1/1
Network	None	None	None	Network	None	None	None	Network	None	Network	None
ESS Solo 1	ESS Maestro 2E	ESS Maestro	ESS Maestro	Intel 82440MX	Soundmax integrated audio	Crystal Audio CS4299	ESS Maestro	ESS Maestro	Yamaha DS-XG	ESS Maestro	ESS Maestro
✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✗/✓	✓/✓	✗/✓	✓/✓	✓/✓	✓/✓
✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓	✓/✓
✓	✓	✗	✓	✓	✗	✓	✓	✓	✓	✓	✓
Win98 SE	Win98 SE	WinNT4	Win98 SE	Win98 SE	Win98	Win95 OSR 2	Win98 SE	Win98 SE	Win98 SE	Win98 SE	Win98 SE
PC Doctor, LAN Desk Mgr	None	Compaq note- book utilities	MS WS2000	Word 2000 LAN Desk Mgr	Lotus SS/ IBM VIAoice	None	None	Laplink Pro	Video capture Picture Gear	None	None

GROUP TEST

NOTEBOOKS >>



Editor's Choice

We've looked at a lot of notebooks this month, from both large and small manufacturers, and it's been interesting to see the variation in specification and prices between them. Some of the machines we looked at were identical in terms of their basic specifications, but were wildly different when it came to price. There was often a tangible difference in build quality, however, and it was this factor more than any other that influenced our view of each product. Performance came into the equation more in the fully-featured section, as it determines whether or not a unit is appropriate as a desktop replacement. It was still a factor in both, however, as was the ever-present value for money.

➤ We saw a lot of quality products in the fully-featured section, but the Gateway Solo 9300 LS blew the competition away and is the deserved winner of our only award in this section, the **Editor's Choice**. It uses Intel's new 600MHz mobile processor, the Pentium III with SpeedStep technology. This gives it blistering performance while plugged into the mains and makes it an ideal candidate to be a desktop replacement. Running on battery power, the processor runs at 500MHz with a consequent performance dip. This is a small price to pay for increased battery life, however, and you can opt to have the processor run at the full 600MHz if you wish. The basic model comes with 64MB of RAM,

but we would advise opting for the 96MB version we reviewed.

The Solo's screen and keyboard are excellent, and both a DVD and floppy have been fitted into its shell. It's also possible to do some basic video-editing on it, using the composite in and out ports on the ATi Mobility video chipset – or for digital video there's a FireWire port. The only drawback is that it is comparatively heavy, but we didn't feel that this was enough to outweigh the good points. The real bonus, though, is its low price at only £2,049 ex VAT – great performance at a truly low price.

HP also submitted a good machine – its Omnibook 4150B, using a Pentium III 650MHz with SpeedStep technology. The fact that it gave the best performance makes it worthy of a mention, but its high price (£3,010 ex VAT) and the fact that the DVD and floppy drive can't both be installed in the case lost it a Highly Commended award.

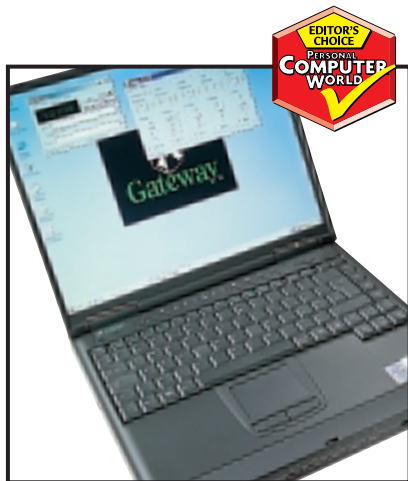
Sony's Vaio PCG-F309 also had some great features comparable to the Gateway Solo 9300LS, but its slower processor and higher price (£2,809 ex VAT) also cost it an award.

➤ Turning to the ultra-portables, there was only ever really one contender for the **Editor's Choice** and that was the Sony Vaio PCG-505SN. The latest in the popular 505 range looks to be as much of a smash hit as the previous incarnations. Using a Pentium II 400MHz processor and 64MB of RAM,

it managed a comfortable performance result. This makes it appropriate for those who want a good compromise between speed and portability. The TFT screen is simply stunning, with an amazing 1,024 x 768 resolution. Despite its tiny size, the keyboard is still extremely comfortable to use, and the large touchpad is similarly good. There's a PC Card CD-ROM and a USB floppy drive in the box, together with a port replicator. This has parallel, serial, USB and FireWire ports. Overall it combines style and an excellent layout with good performance and a great screen. It's a deserved winner, especially at its low price of £1,449 ex VAT.

➤ If you're after a faster processor, an internal modem and network connection, however, then there's also the Acer TravelMate 342T, which wins a **Highly Commended** award. It was the only ultra-portable to have a Pentium III; running at 500MHz. It has a solid 64MB of memory and a large 9GB hard drive. One drawback is that the screen only has a native resolution of 800 x 600, but for most users this will not be a huge issue. A separate unit is supplied that contains the floppy and CD-ROM, but you'll probably want to leave this on your desk.

Overall, it is a very well-designed notebook with a comfortable keyboard and touchpad. You pay a small premium for the extra performance, but it's still an excellent buy at £1,899 ex VAT.



The Gateway Solo 9300 LS took the fully-featured crown for its speed and low price



Sony's Vaio PCG-N505SN has inherited the good looks of its ultra-slim predecessors



The Acer TravelMate342T was the only ultra-portable to include a mobile PIII chip



Tough customers

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EIDE hard drives

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Maxtor Diamond Max Plus 40
Quantum Fireball CX
- 197** Quantum Fireball Plus KX
Seagate Barracuda ATA
Seagate U8
- 198** Western Digital Caviar 307AA

SCSI hard drives

- 198** IBM UltraStar 18LZX
IBM UltraStar 36ZX
- 201** Quantum Atlas IV
Quantum Atlas 10K
Seagate Barracuda 50
- 202** Seagate Cheetah 18LP
Seagate Cheetah 36
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• Hard drives tested by David Ludlow and reviewed by Riyad Emeran.

You can never have too much hard-disk space, and a good hard drive can mean the difference between waiting for data or getting on with your life. To help you make that all-important decision, we've put 15 EIDE and SCSI drives through their paces.

As components go, processors seem to get the most exposure. People usually decide what PC they are going to buy on the speed and type of the CPU. However, the hard disk is a very important part of a PC and deserves a great deal of consideration before purchase as well.

A hard disk is also one of the only components that you can upgrade your PC with, without having to discard the old one. Your system will run quite happily with more than one hard drive inside it. That said, you're still best buying the best hard drive to suite your needs in the first place.

A hard disk can affect the performance of a system and the amount of hard-disk space can directly affect what type of work can be done on a machine.

There are generally two types of hard-disk interface, EIDE and SCSI. EIDE tends to be the standard for everyday use, while SCSI tends to fall more in the realm of the professional, a fact that is born out by the price premium paid for SCSI drives.

To cover the market fully we tested both EIDE and SCSI devices. So, if you want to find out who offers the best storage solution, read on.

IBM DeskStar 34GXP

EIDE



IBM HAS MADE A big splash in the hard-disk market recently, producing large, high-performance EIDE devices that have tempted many workstation users away from SCSI.

This 34GB disk makes good use of IBM's GMR (giant magneto resistive) head technology, squeezing an impressive amount of data across only five platters and maintaining the standard 1in-high form factor.

This drive should handle almost anything you throw at it, including video or sound editing. The spin rate of 7,200rpm produces an average latency of 4.17ms. While the drive interface conforms to the latest UltraDMA66 standard. The 2MB data buffer is up there with the SCSI drives and should ensure a smooth transfer of data.

However, the most impressive aspect of this drive is the price. At £205 ex VAT, the DeskStar 34GXP provides a price per GB of £6. Compare this to a SCSI drive

and you'll see why the EIDE option is becoming more attractive. The drive's performance is almost as impressive as the price, with the 34GXP performing the sequential write test faster than both the 7,200rpm SCSI units. However, the score of 0.85Mbytes/sec in the random read and write test was some way behind the SCSI devices.

DETAILS

★★★★

PRICE £240.88 (£205 ex VAT)

CONTACT IBM 01475 898 125

www.ibm.com/harddrive

PROS High capacity, reasonable value

CONS There are faster and cheaper devices available

OVERALL A good high-capacity EIDE drive

Maxtor Diamond Max Plus 40

EIDE



THE MAXTOR IS THE LARGEST EIDE hard disk on test, sporting a whopping 40GB. The data density of the drive is amazing, with 40GB spread over only four platters and serviced by eight GMR

heads. Data density can directly affect the performance of a hard disk. The closer the data is packed together, the less distance the heads have to move to read that data – ultimately speeding up the overall performance.

Consequently, the Maxtor was able to perform the sequential write test faster than any other drive, including the SCSI units. It did only manage 0.8Mbytes/sec during the random read and write test, though.

Performance is also aided by the 7,200rpm spindle speed, currently the fastest spin rate supported by EIDE drives. The data buffer matches the SCSI drives at 2MB.

However, the Maxtor isn't just very fast, it also offers great value for money.

With a price of £230 ex VAT, the Maxtor turns in a cost per GB of only £5.75.

Maxtor has produced an incredible EIDE solution for the very space-hungry user. If you need masses of space and fast EIDE performance, the Diamond Max Plus 40 is definitely worth a look. For the video editor on a budget, it's a dream come true.

DETAILS

★★★★★

PRICE £270.25 (£230 ex VAT)

CONTACT RK Distribution 01844 261 226

www.maxtor.com

PROS Very high capacity, fast

CONS Higher cost per GB than the Seagate

OVERALL If the Seagate is too small, this is a great alternative

Quantum Fireball CX

EIDE



THE QUANTUM FIREBALL hard disk was a formidable unit a few years ago. Quantum moved up to a spindle speed of 5,400rpm, while much of the competition were stuck on 4,500rpm.

The result was that the Fireball became the most sought after EIDE hard disk.

Unfortunately, Quantum didn't keep up the momentum and many other drive manufacturers stole its thunder.

Now Quantum has split its drives into two distinct categories, the 5,400rpm value drives and the 7,200rpm performance drives. This unit falls into the former category.

The areal density is fairly low, with the 20GB spread across six physical platters. This is disappointing, since the 28GB Seagate Barracuda spans only four platters. The fact that Quantum has used standard magneto resistive heads instead of GMR ones is probably the reason for this.

Another strange decision was

deciding to equip the drive with only a 512KB data buffer. Since the majority of the drives on test have a 2MB buffer, the Fireballs are a little lacking.

Unfortunately, the Fireball CX can't even be saved by its price. At £135 ex VAT it's only £8 cheaper than the Seagate Barracuda, that is both faster and more capacious.

DETAILS

★★

PRICE £158.62 (£135 ex VAT)

CONTACT Quantum 01344 353 500

www.quantum.com

PROS None

CONS Slow, small data buffer, expensive

OVERALL The Fireball CX is completely eclipsed by the competition

Quantum Fireball Plus KX

EIDE



ALTHOUGH QUANTUM DESIGNS its own drives, they are actually manufactured by Matsushita, more commonly known as Panasonic in the west. It's been a fairly successful partnership so far, with

Quantum generating good design ideas and Panasonic providing the production capacity. Unfortunately Quantum's design prowess seems to have deserted it, at least with its EIDE range of disks.

The Fireball Plus KX falls into the high-end range of Quantum's EIDE hard disks, and spins at a rate of 7,200rpm. Unfortunately, the Fireball KX shares the small 512KB data buffer of its slower sibling. That said, performance wasn't all bad. The sequential write was far from impressive, but it managed a very healthy 0.9Mbytes/sec transfer rate in the random read and write test.

However, even with the impressive random-access transfer, this particular Fireball KX is difficult to recommend. With a capacity of only 10GB, the KX

still costs just over £100 ex VAT, turning in a cost per GB of around £10. That's almost twice the cost of the Seagate Barracuda. The KX is also a little behind in the technology stakes, using MR heads instead of the latest GMR heads for greater areal density. Ultimately, spending a little bit more money will get you a lot more disk.

DETAILS

- ★★
- PRICE** £123.37 (£105 ex VAT)
- CONTACT** Quantum 01344 353 500
- www.quantum.com
- PROS** Fast random transfer rate
- CONS** Low capacity, small data buffer
- OVERALL** The Fireball KX exhibits poor value and dated technology

Seagate Barracuda ATA

EIDE



SEAGATE HAS A STRONG reputation for producing quality SCSI hard disks with well-known brand names. So far, however, no such brand awareness has been evident in its EIDE devices, until

now. The Barracuda is one of Seagate's most successful brands – it took a relative strangle-hold on the SCSI market a few years back. Now Seagate has decided to brand its high-end EIDE drives with the Barracuda name as well – definitely a smart move.

Being aimed at the high-end EIDE market, the Barracuda's spin speed is 7,200rpm, and this makes it a quick performer. In fact, it was the second-fastest drive in the sequential write test and managed 0.89Mbytes/sec in the random read and write test.

There is also one feature that sets this drive apart from the competition. On the underside of the drive casing you'll find detailed installation instructions. It even has illustrations,

showing how the EIDE cable should be inserted. Although this information will be redundant for many installers, for the novice user it's a great bonus.

Add the fact that there's 28GB of storage space for the reasonable price of £143 ex VAT (a cost per GB of only £5.10) and the Barracuda ATA looks even more attractive.

DETAILS

- ★★★★★
- PRICE** £168.03 (£143 ex VAT)
- CONTACT** SMC Direct 01753 550 333
- www.seagate.com
- PROS** Fast, capacious, great value, good installation instructions
- CONS** None
- OVERALL** The best EIDE hard disk available



Seagate U8

EIDE



SEAGATE'S SECOND ENTRANT into the EIDE section is a more budget-oriented model than the award-winning Barracuda. In fact, it's the cheapest disk on test, with the very affordable price

tag of only £85 ex VAT. That said, considering its capacity is only 13GB, you're only getting a cost per GB of £6.53. Not the best value for money, but if you can't stretch your budget too far, it's not bad.

Unlike the Barracuda, this drive spins at only 5,400rpm bringing in an average latency of 5.56ms. Areal density is higher than the 10GB Quantum Fireball KX, with the 13GB of storage spread across only two platters. But don't expect lightning performance from this unit. It turned in the lowest transfer rate in the random read and write test at 0.66Mbytes/sec and the sequential write time was only a couple of seconds in front of the Quantum Fireball CX.

However, there are a couple of things that set this Seagate drive apart from the pack. For a start, the drive casing is surrounded by a black rubber sheath. We assume that this is to reduce the noise made by the drive. It also has installation instructions printed on it, but not to the same level of detail as its Barracuda brother.

DETAILS

- ★★★
- PRICE** £99.87 (£85 ex VAT)
- CONTACT** SMC 01753 550 333
- www.seagate.com
- PROS** Low price, instructions on casing
- CONS** Slow, fairly low capacity
- OVERALL** Worth a look if you're on a very tight budget



Western Digital Caviar 307AA

EIDE



THE WESTERN DIGITAL CAVIAR range of hard disks has been on the market for a very long time. This latest addition is aimed at the value – rather than the performance – user and WD seems to

have hit the target pretty much on the bull's-eye.

Unlike the majority of the drives on test, the Caviar spins at only 5,400rpm instead of 7,200rpm, producing an average latency of 5.5ms. However, other than the reduced spin rate, the Caviar is a top-notch drive.

Thanks to the GMR heads the data density is extremely high, spreading over 30GB of data across only three physical platters. The data density, coupled with the 2MB data buffer ensures that the Caviar still puts in a respectable performance – considerably faster than the Quantum Fireball CX, that also spins at 5,400rpm.

However, the best aspect of the Western Digital is the price. At only

£169 ex VAT you're getting a cost per GB of £5.52, which represents good value for money.

Although the computer industry is driven by numbers, you don't necessarily need to have the fastest hard disk money can buy. For everyday use, the Caviar is more than adequate and you're getting a lot of storage space for your money.

DETAILS

★★★★

PRICE £198.57 (£169 ex VAT)

CONTACT Western Digital 01372 360 055

www.wdc.com

PROS High capacity, low cost

CONS Relatively slow

OVERALL If speed isn't an issue, this drive is worth a look

IBM UltraStar 18LZX

SCSI



IBM HAS BUILT A REPUTATION for producing good hard disks, and the 18LZX is no exception. It shares the same areal density as its larger 36GB brother, spreading its storage over five

platters rather than 10. The L in its name stands for Low Profile, since the five physical disks are squeezed into a 1in-high case. This makes it applicable to lower-end servers, which may not be able to accommodate larger drives, while its price may also attract users who can't afford a 36GB device.

Unsurprisingly, the average latency is brought down to a very respectable 2.99ms, thanks to the 10,000rpm spindle speed. Only Hitachi has a disk that spins faster than this, but its 12,000rpm Pegasus II drive uses 2.5in platters instead of the standard 3in models, to keep the heat under control.

Like its big brother, the UltraStar 18LZX sports a 2MB data buffer and GMR heads. Performance was

respectable, beating the 18GB Cheetah in the sustained write test, but not quite matching the speed of the Western Digital Enterprise drive. Random reads and writes produced a 1.41Mbytes/sec transfer rate – the second fastest on test.

The 18LZX is a good drive if you need the speed, but if not, the Quantum Atlas IV is almost £100 cheaper.

DETAILS

★★★★

PRICE £421.82 (£359 ex VAT)

CONTACT SMC Direct 01753 550 333

www.ibm.com/harddrive

PROS Fast, low profile casing

CONS Pricey compared to the Atlas IV

OVERALL A great disk for a fast workstation or small server

IBM UltraStar 36ZX

SCSI



OVER THE PAST COUPLE of years IBM has made some significant advances in hard-disk technology, the most important being the implementation of GMR heads. These heads are more

sensitive than standard MR heads, which means they can read data that is very tightly packed together. This allows IBM to increase the areal density on its physical platters and thus increase the overall speed of the drive by reducing the amount of head movement.

As a result this drive spreads its 36GB across 10 platters, as opposed to the 12 platters employed by the Cheetah. Unfortunately, even with the high data density, IBM has still had to opt for a 1.5in-high drive case.

As well as the high areal density, this drive provides a spindle speed of 10,000rpm, producing an average latency of 2.99ms.

The 36ZX managed the fastest sequential write speed, making it an

ideal device for the likes of video editors. There's also a healthy 2MB buffer cache, to ensure a steady flow of information.

The only downside is the power consumption. This baby will draw a whopping 17.4W of power while it's idle, so make sure you have a decent-sized power supply. Apart from that, this is a first-rate, high-capacity drive.

DETAILS

★★★★

PRICE £786.07 (£669 ex VAT)

CONTACT SMC Direct 01753 550 333

www.ibm.com/harddrive

PROS Fast and capacious

CONS Draws a lot of power

OVERALL A great high-speed, high-capacity drive at a good price



Quantum Atlas IV

SCSI



QUANTUM IS ABOUT TO RELEASE the Atlas V drive – which is unfortunate, as it would have been good to see the latest drive that Quantum had to offer, rather than one reaching the end of its lifecycle.

The Atlas IV is not aimed at the very high-performance user, although its 7,200rpm spindle speed still makes it more than adequate for workgroup and file servers. It's hard to judge the Atlas IV in this company, since the only other 7,200rpm drive is the 50GB Seagate Barracuda, which is a different product altogether.

Unsurprisingly, the Atlas IV scored similarly to the Barracuda in the performance tests, but it was no match for the 10,000rpm drives.

Like the Western Digital Enterprise, the Atlas IV spreads its 18GB across only four platters, giving it a fairly high areal density and allowing everything to be squeezed into a 1in-high case. Unlike the Western Digital, however, the Atlas IV

sports an average latency of 4.17ms because of its slower spin rate. The data buffer is an ample 2MB, twice the size of the 18GB Seagate Cheetah.

Power consumption is a low 7.9W, making it ideal if you don't have a heavy-duty power supply. The Atlas IV isn't the fastest SCSI solution, but it offers better value than the 10,000rpm units.

DETAILS

★★★★

PRICE £316.07 (£269 ex VAT)

CONTACT SMC Direct 01753 550 333

www.quantum.com

PROS Good value for money

CONS Not as fast as the 10,000rpm drives

OVERALL Like the Barracuda, the Atlas IV is a great drive if speed isn't paramount

Quantum Atlas 10K

SCSI



THE ATLAS 10K LOOKS considerably different to all the other Quantum drives on test. The main change is the array of heat fins surrounding the casing where the disk platters reside. This is a wise

and common design with 10,000rpm drives, since the excessive spin speed causes an alarming amount of heat.

Like the Atlas IV, this Atlas 10K is Ultra160 compatible, although you won't see much benefit unless it's part of a hefty RAID array. The data is spread across 12 platters, serviced by 24 heads. This makes the areal density lower than the GMR-equipped IBM UltraStar 36ZX, so unsurprisingly it's slower than the IBM drive. However, it has the same number of platters as the 36GB Seagate Cheetah but that drive also beats the Atlas 10K.

Power consumption is just below the Cheetah at 15.5W and almost 2W lower than the IBM drive. The data buffer is 2MB, which seems pretty standard in

this test. Only the Fibre Channel variety of the drive comes with an increased buffer of 4MB.

As with all the drives in this SCSI category, the Atlas 10K will be up to almost any task you throw at it.

However, it's slightly more expensive than the faster IBM drive, making it seem like a less attractive prospect.

DETAILS

★★★★

PRICE £797.82 (£679 ex VAT)

CONTACT SMC Direct 01752 550 333

www.quantum.com

PROS Reasonable price

CONS Not the fastest on test

OVERALL A decent alternative if you can't get the IBM UltraStar

Seagate Barracuda 50

SCSI



ALTHOUGH MOST USERS generally want the fastest hard drives they can get, it's sometimes not necessary to have a 10,000rpm unit. For many uses, a disk spinning at 7,200rpm is more than

adequate and the cost savings can be significant. Also, since a 7,200rpm unit runs considerably cooler than a 10,000rpm model, you'll need less cooling in your machine.

The Barracuda is a bit of a classic in the world of high-performance SCSI drives, and at one time was the drive of choice for most uses. It may no longer be the formidable piece of hardware it was, but it's still a great piece of kit.

This particular drive breaks with the SCSI tradition of doubling capacities with each generation. Instead of jumping from 36GB to 72GB, Seagate has opted for a middle capacity of 50GB. The areal density is quite impressive, with the 50GB of space spread across only 11 platters – that's

fewer physical surfaces than its cousin the Cheetah uses to store only 36GB.

That said, the most important aspect of this drive is price. Considering that it is cheaper than all the 36GB 10,000rpm drives, its value for money is outstanding. If you want very high capacity and can live without cutting-edge performance, it is worth a look.

DETAILS

★★★★★

PRICE £645.07 (£549 ex VAT)

CONTACT SMC 01753 550 333

www.seagate.com

PROS Huge capacity, great value for money

CONS 1.5in case height

OVERALL A stunning top value drive, ideal for a file server



Seagate Cheetah 18LP

SCSI



SEAGATE WAS THE FIRST hard-drive manufacturer to push the spindle speed to 10,000rpm. Prior to this, the fastest SCSI hard disks ran at a spindle speed of 7,200rpm. Of course, it didn't take the

competition too long to catch up with Seagate and produce 10,000rpm drives of their own. That said, Seagate made quite a splash with the Cheetah, building on the previous success of the Barracuda range, and they are still the drive of choice in many server and workstation set-ups.

This breed of Cheetah has an 18GB capacity in a 1in-high case, hence the 18LP name, where LP stands for Low Profile. The smaller dimensions make this drive attractive to the workgroup-server market, although probably in an SCA version. Inside the casing are six platters, serviced by 12 MR heads. The 10,000rpm spindle speed produces an average latency of 2.99ms.

Performance was a little behind its

36GB big brother, but this is to be expected – since the larger drive has a 4MB data buffer, compared to the 1MB buffer on this unit.

On the whole, this is a decent high-end drive, but it's more expensive than the IBM UltraStar 18LZX, which has a 2MB buffer, GMR heads and faster sequential write speeds.

DETAILS

★★★★

PRICE £457.07 (£389 ex VAT)

CONTACT SMC Direct 01753 550 333

www.seagate.com

PROS Better value than its 36GB cousin

CONS Only 1MB data buffer

OVERALL Not a bad drive, but outclassed by the IBM UltraStar

Seagate Cheetah 36

SCSI



CHEETAH'S LARGER-CAPACITY drive is also physically larger at 1.5in-high. This could make it incompatible with smaller workgroup servers, but you're unlikely to want multiple 36GB disks in a small

workgroup server. The Cheetah sports heat fins around the outside edge of the case where the platters reside. This design will help dissipate the excessive heat generated by the 10,000rpm spindle speed, which was a problem with early Cheetah drives.

Differentiating itself from its smaller brother, the 36GB Cheetah sports a 4MB data buffer that should provide smoother and faster sustained transfer rates. The average latency is identical to all 10,000rpm drives at 2.99ms. The Cheetah managed to perform the sustained write test faster than the 36GB Quantum Atlas 10K, but came in a little slower than the IBM UltraStar. For random reads and writes, it managed a transfer rate of

1.38Mbytes/sec, which is a little behind a couple of the 18GB drives.

This drive is double the capacity of the other Cheetah on test in every way, it has double the amount of physical disks and heads at 12 and 24 respectively. The areal density is therefore the same as the smaller drive, which is why the performance is similar between the two.

DETAILS

★★★★

PRICE £938.82 (£799 ex VAT)

CONTACT SMC Direct 01753 550 333

www.seagate.com

PROS Relatively fast

CONS Relatively expensive

OVERALL IBM's UltraStar 36ZX is a more cost-effective 10,000rpm drive

Western Digital Enterprise

SCSI



WESTERN DIGITAL USED TO BE a force to be reckoned with in the hard-disk market. Around the time of the 486 you couldn't buy a better or faster hard disk than a WD. Unfortunately the company

lost its crown to the likes of Seagate and IBM. That said, it's had a bit of a renaissance of late and has started to produce some first-rate products.

Western Digital licenses IBM's GMR head technology, allowing it to push the areal density on its drives quite high. Consequently, the WD has managed to spread the 18GB of data across only four physical platters, which is one less than the IBM UltraStar and two fewer than the Seagate Cheetah. Only the 7,200rpm Quantum Atlas IV has managed to match the density of the Enterprise.

The high data density, coupled with a 2MB data buffer, helped the WD produce some impressive results in our tests. It was the second-fastest drive in

the sequential write test and produced a random read and write transfer of 1.37Mbytes/sec. Power consumption is average for a drive of this size, at 11W.

Ultimately, Western Digital has produced a very impressive 10,000rpm SCSI hard disk. It's a little bit more expensive than the competition, but not prohibitively so.

DETAILS

★★★★

PRICE £539.32 (£459 ex VAT)

CONTACT SMC Direct 01753 550 333

www.wdc.com

PROS Solid specification, fairly fast

CONS More expensive than some

OVERALL A good drive but a little pricey compared to others on test

Getting to grips with disk-drive interfaces

Perhaps the most confusing thing about buying a new hard drive is trying to make sense of the different interfaces. The base level is a choice between IDE and SCSI, but inside each of these interfaces is a subset of standards, all of which can be confusing.

The best place to start is with IDE, the most readily-available interface for the PC, appearing as standard on the majority of motherboards. The name IDE, which stands for Integrated Drive Electronics, is a little confusing in itself. It basically means that the controller for the hard drive is on-board the drive itself. This provides less interference and therefore higher reliability. However, it's not just IDE that puts the drive controller on-board, so more correctly IDE should be referred to as ATA (AT Attached).

Starting at the beginning, ATA specified a standard for connecting hard drives of up to 504MB to a PC. The specification detailed the master/slave relationship that restricts ATA to two devices per channel.

The ATA specification defined three different transfer modes for hard drives to operate in. First on the menu was Programmed Input/Output (PIO). PIO mode is very processor-intensive, as it requires the CPU to deal with the job of writing data from the drive to main memory. However, the ATA specification also provided details for a more sensible method of transferring data, Direct Memory Access (DMA). DMA, as the name suggests, allows a device – in this case a hard drive – to write data directly to memory. This frees up the processor for more important tasks.

Transfer modes

Just to make things more confusing there are two DMA transfer methods: Single Word, and Multiword. Single Word DMA is now an obsolete standard and has mainly been replaced by the more advanced Multiword DMA, which allows for faster transfer rates. For a full look at all the transfer modes available for different ATA standards, take a look at the ATA Standards table.

SCSI

An interface that is technically better, although more expensive, is the Small Computer System Interface (SCSI) standard. Thanks to the clever initial specification, little has changed over time except higher speeds. SCSI is a parallel interface that is designed to allow all manner of devices to be attached, both internally and externally. Traditionally it was a more complex standard, with each new standard having different cabling, and confusing rules saying which devices you could and couldn't mix. In recent years things have changed, and SCSI is not nearly as complex as it used to be. Newer SCSI host adaptors will include a 50-pin connector for legacy devices, and a 68-pin connector for newer, faster devices, so it's just a matter of plugging your kit into the correct connectors.

SCSI started off with SCSI-1 which defined a 5Mbytes/sec 8bit bus. However, as SCSI-1 only supported a single device, you're more likely to know

standards can now support up to 15 devices per channel.

At this point it's important to understand Narrow and Wide SCSI. Narrow SCSI has an 8bit bus, and Wide has a 16bit bus. Wide SCSI is therefore twice as fast as narrow. Typically inside a SCSI standard you'll find both narrow and wide. This explains why you get Ultra SCSI, and Ultra Wide SCSI. For a full view of SCSI standards and speeds, see the table below.

LVD

Originally SCSI ran over Single Ended (SE) cabling. This transmitted bits down a single cable, and was fine for speeds up to 40Mbytes/sec. Once SCSI speeds reached 80Mbytes/sec (Ultra2 Wide), a new technology called Low Voltage Differential (LVD) was introduced. LVD allows reliable transmission at this speed by transmitting data over two wires, one a mirror image of the other. Without LVD, cable lengths would be dramatically reduced, and reliability wouldn't be very good due to interference. However, as LVD and SE devices can both be run over 68-pin cabling, it's worth pointing out that you shouldn't run them both over the same SCSI channel, as this will slow down the LVD devices.

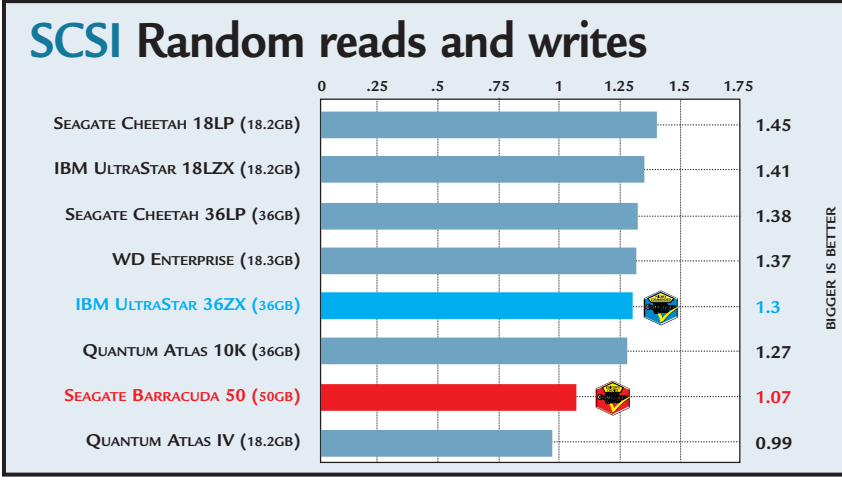
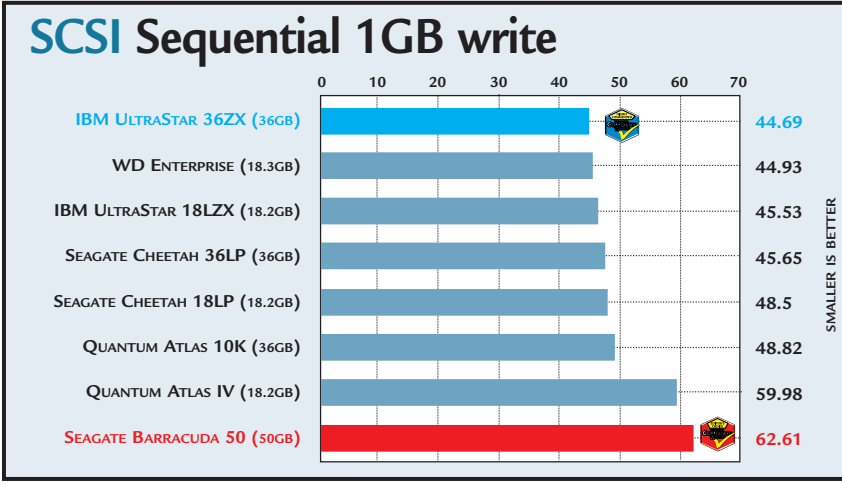
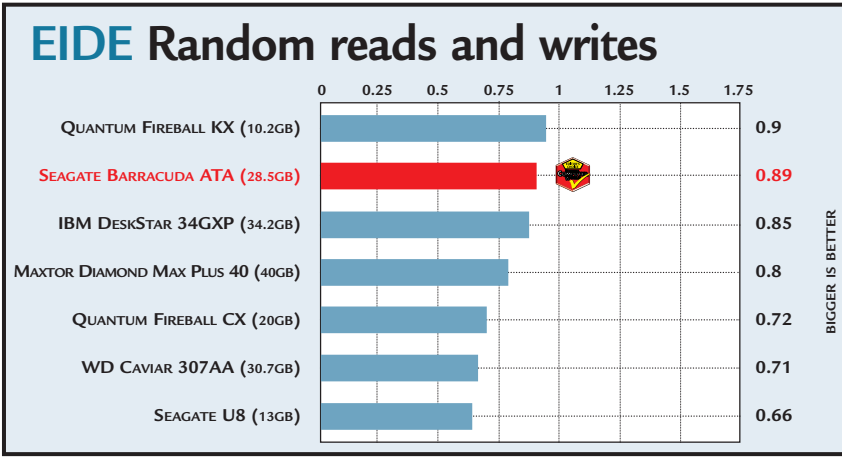
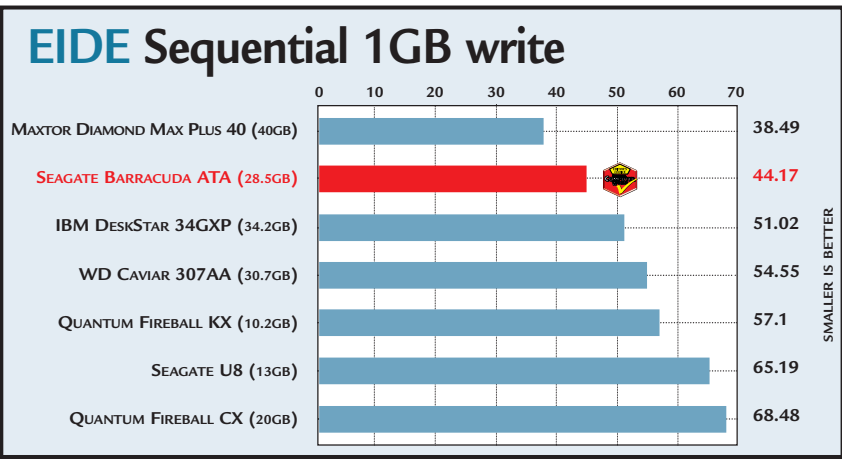
One final point about SCSI is the introduction of the SCA (Single Connector Attachment) interface. SCA appears on hard drives and allows the drive to get power, a SCSI ID, and connection to the SCSI bus through a single 80-pin connector. Typically this is used on servers for hot-swap drives, but you can get converters so that they'll run in a standard PC.

DAVID LUDLOW

SCSI speeds				
Narrow (8bit)			Wide (16bit)	
Standard	Protocol	Transfer rate (Mbytes/sec)	Protocol	Transfer rate (Mbytes/sec)
SCSI-1	SCSI-2	5	Wide SCSI	10
Fast	Fast SCSI	10	Fast-Wide SCSI	20
Ultra	Ultra SCSI	20	Ultra-Wide SCSI	40
Ultra2			Ultra2-Wide SCSI (LVD)	80
Ultra160			Ultra160 (LVD)	160

IDE speeds			
Standard	DMA modes	PIO modes	Max transfer (Mbytes/sec)
ATA	Single Word 0,1,2. Multiword 0	0, 1, 2	8.3
ATA-2	Single Word 0,1,2. Multiword 0, 1, 2	0, 1, 2, 3, 4	16.6
Ultra ATA/33	Single Word 0, 1, 2. Multiword 0, 1, 2, 3	0, 1, 2, 3, 4	33.3
Ultra ATA/66	Single Word 0, 1, 2. Multiword 0, 1, 2, 3, 4	0, 1, 2, 3, 4	66.6
ATAPI	Single Word 0, 1, 2. Multiword 0, 1, 2	0, 1, 2, 3, 4	16.6

SCSI as SCSI-2. This ran at the same speed as SCSI-1, but allowed up to seven devices to be attached to it. This introduced the ID number system, whereby each device has a unique user-defined number to identify it to the system. Even the host adaptor must have an ID number. Improvements have been made so that newer SCSI



How we did the tests

Testing hard drives is not easy. Two kinds of access modes need to be looked at: random and sequential. Random access is used when the drive needs to get at information stored on different parts of the disk, and as such requires that multiple seeks – the drive moving its heads – are performed over the surface of the disk drive.

Sequential access is when the drive reads contiguous data. This typically returns faster results as the drive only needs to move its heads to find the start of the data, and only to change tracks after that. Manufacturers usually quote sequential access when mentioning maximum transfer rates. However, this is a little unrealistic, as a drive rarely reads large sequential files for any length of time. So, to get a better idea of performance both sequential and random access need to be looked at.

In order to test the drives fairly we used the following setup: a Dell PowerEdge 6300 Quad Xeon server, with a 64bit PCI Adaptec 29160 host adaptor for the SCSI drives, and a Promise UltraDMA/66 card for the IDE drives. The high-spec machine made sure any performance results were down to pure drive speed due to there being no I/O performance bottlenecks in the server.

Performance testing was done with two tests. First, sequential write speeds were tested by timing a copy operation of a 1GB zip file from the server's RAID partition to the test drive. The reason for the RAID partition was to make sure the source we were streaming data from was quicker than the destination, otherwise we'd just be testing the server's read speed. Timing was done by recording the system clock time before the copy operation began, and again once the copy operation had finished. This was automatically logged to a text file via a batch file we wrote to perform the test. The quicker the time in which the drive wrote the file, the faster the drive.

To test Random operations we used Intel's Iometer version 1998.10.08. This allows user-defined access parameters to be applied to a given drive. We used an access specification called 'File Server'. This was set to perform random reads and writes to a drive, for different sized files. To be more precise, one-third of the operations were writes, and two-thirds were reads. This kind of specification gives a more accurate representation of how the drive will perform running software such as Windows. The end result gives an idea of how fast a drive is under normal stress conditions. The results are presented as Mbytes/sec, and the higher the figure the faster the drive.



EIDE HARD DRIVES							
MANUFACTURER	IBM	MAXTOR	QUANTUM	QUANTUM	SEAGATE	SEAGATE	WESTERN DIGITAL
MODEL	DeskSTAR 34GXP	DIAMOND MAX PLUS 40	FIREBALL CX	FIREBALL PLUS KX	BARRACUDA ATA	U8	CAVIAR 307AA
Model number	DPTA-373420	54098U8	CX20A011	KX10A00A	ST328040A	ST313021A	WD307AA-00ANA0
Price (ex VAT)	£205	£230	£135	£105	£143	£85	£169
Supplier	IBM	RK Distribution	Quantum	Quantum	SMC Direct	SMC Direct	Western Digital
Phone Number	01475 898 125	01844 261 226	01344 353 500	01344 353 500	01753 550 333	01753 550 333	01372 360 055
DRIVE SPECS							
EIDE type	UltraDMA/66	UltraDMA/66	UltraDMA/66	UltraDMA/66	UltraDMA/66	UltraDMA/66	UltraDMA/66
Nominal capacity (GB)	34.2	40.98	20.4	10.27	28	13	30.7
Price per GB (ex VAT)	£5.99	£5.61	£6.62	£10.22	£5.11	£6.54	£5.50
Height (inches)	1	1	1	1	1	1	1
Spindle speed (rpm)	7,200	7,200	5,400	7,200	7,200	5,400	5,400
Buffer (KB)	2,048	2,048	512	512	512	512	2,048
Read head technology	GMR	GMR	MR	MR	GMR	GMR	GMR
Read channel technology	PRML	PRML	PRML	PRML	EPRML	EPRML	PRML
Idle power consumption (W)	6.9	6.6	6.2	7.5	7.5	3.5	6.18
Heads	10	8	6	3	8	3	6
Platters	5	4	3	2	4	2	3
Cylinders	17,494	79,406	15,957	16,878	16,383	16,383	16,383
Track density (tracks per inch)	18,300	19,700	16,700	16,700	16,420	18,700	Not supplied
SMART capable	✓	✓	✓	✓	✓	✓	✓
PERFORMANCE							
Average read seek (ms)	9	9	9.5	8.5	8	8.9	9.5
Average latency (ms)	4.17	4.17	5.56	4.17	4.17	5.56	5.5
Track to track (ms)	2.2	1	2	0.8	0.9	1.5	2
Full stroke (ms)	15.5	20	18	15	14.5	23	19
OTHER INFORMATION							
Standard warranty (years)	3	3	3	3	3	3	3

SCSI HARD DRIVES								
MANUFACTURER	IBM	IBM	QUANTUM	QUANTUM	SEAGATE	SEAGATE	SEAGATE	WESTERN DIGITAL
MODEL	ULTRASTAR 18LZX	ULTRASTAR 36ZX	ATLAS 10K	ATLAS IV	BARRACUDA 50	CHEETAH 18LP	CHEETAH 36	ENTERPRISE
Model number	PN09L3905	PN09L3903	TN36L011	KN18L011	ST150176LW	ST318203LW	ST3136403LWV	WDE18310-005042
Price (ex VAT)	£359	£669	£679	£269	£549	£389	£799	£459
Supplier	SMC Direct	SMC Direct	SMC Direct	SMC Direct	SMC Direct	SMC Direct	SMC Direct	SMC Direct
Phone	01753 550 333	01753 550 333	01753 550 333	01753 550 333	01753 550 333	01753 550 333	01753 550 333	01753 550 333
DRIVE SPECS								
SCSI type	Ultra2	Ultra2	Ultra160	Ultra160	Ultra2	Ultra2	Ultra2	Ultra160
Nominal capacity (GB)	18.3	36.7	36.4	18.2	50.1	18.2	36.4	18.3
Price per GB (ex VAT)	£19.62	£18.23	£18.65	£14.78	£10.96	£21.37	£21.95	£25.08
Height (inches)	1	1.5	1.6	1	1.5	1	1.5	1
Spindle speed (rpm)	10,000	10,000	10,000	7,200	7,200	10,000	10,000	10,000
Buffer (KB)	2,048	2,048	2,048	2,048	1,024	1,024	4,096	2,048
Read head technology	GMR	GMR	MR	MR	MR	DSMR	DSMR	GMR
Read channel technology	PRML	PRML	24/25 RLL PRML	24/25 RLL PRML	PRML	PRML	PRML	EPRML
Idle power consumption (W)	11.5	17.4	15.5	7.9	11.8	10.4	15.7	11
Heads	10	20	24	8	22	12	24	8
Platters	5	10	12	4	11	6	12	4
Cylinders	11,748	11,748	10,042	13,816	12,024	9,801	9,801	13,614
Track density (tracks per inch)	13,595	13,595	13,060	13,700	12,905	12,580	12,580	13,500
SMART capable	✓	✓	✓	✓	✓	✓	✓	✓
PERFORMANCE								
Average read seek (ms)	4.9	5.4	5.5	6.9	7.4	5.4	6.5	6.6
Average latency (ms)	2.99	2.99	2.99	4.17	4.17	2.99	2.99	2.99
Track to track (ms)	0.3	0.3	0.8	0.8	0.9	0.7	0.8	0.6
Full stroke (ms)	10.6	11.4	13	15	16	12.2	14.2	14.5
OTHER INFORMATION								
Standard warranty (years)	5	5	3	3	5	5	5	3



Editor's Choice

Choosing the right hard disk is a tricky decision. There's a certain degree of economies of scale involved, where the larger the drive you buy, the lower the cost per GB will be. That said, most people are on a set budget, so working things out in a cost per GB manner isn't possible. To cater for this we looked at a number of different capacity drives in both EIDE and SCSI flavours.

This test has shown that there is still a huge gap between the cost of EIDE and SCSI drives, while the difference in performance between the two interface types is growing smaller all the time. Considering that there are fewer and fewer tasks that require a SCSI I/O system, EIDE has become far stronger. And with the introduction of EIDE RAID controllers, you don't even have to go down the SCSI route for video-editing workstations or small department servers.

That said, SCSI will always be the interface of choice for high-end applications. With the bandwidth now up to 160Mbytes/sec, even the largest server isn't likely to hit any I/O bottlenecks. Also, SCSI has the advantage of being able to attach up to 15 devices, whereas most EIDE systems can only manage four.

Another interface for hard disks is Fibre Channel. This is a very high-end I/O interface and boasts bandwidths even faster than that of SCSI. Fibre Channel managed a

bandwidth of 100Mbytes/sec, while SCSI was still stuck at 40Mbytes/sec. Now Adaptec is predicting that Fibre Channel will be up to 1Gbyte/sec bandwidth by Q2 this year. Also, Fibre Channel drives don't need to be connected to a computer and can be attached to a Fibre Channel switch directly connected to a network. Finally, the length of cable between drives and controllers far exceeds that of SCSI and can even span between buildings. Although most high-end drive manufacturers produce Fibre Channel variants of their drives, SCSI is still the most common variety found.

We couldn't really talk about hard disks without mentioning IBM's landmark product: the Microdrive. This feat of technical engineering squeezes a 340MB hard disk into a CompactFlash card. Not only does the Microdrive have unlimited implementations, it also shows that the hard disk still has a bit of life left in it as a PC device. No doubt IBM will eventually filter down some of the technology used in the Microdrive into its regular hard disks, especially the shock resistance. And don't be surprised if we start to see CompactFlash hard disks from some of the other manufacturers in this test in the not too distant future.

Surprisingly, the same manufacturer managed to grab the Editor's Choice award in both categories, producing two superb hard disks.

In the SCSI section, Seagate stole the show with its massive 50GB Barracuda and won the **Editor's Choice** in the process. This unit managed to squeeze in 14GB more storage space than any other SCSI device, even though it used one less platter than the 36GB Cheetah also produced by Seagate. It may only spin at 7,200rpm, but this is fast enough for most uses, and it costs less than all the 36GB 10,000rpm units. For a small business or a department looking for a storage solution for a server, this drive is a godsend. So if you're looking for a massive SCSI hard disk at a great price, this is it.

Also in the SCSI section, the IBM UltraStar 36ZX wins a **Highly Commended** award. Spinning at 10,000rpm, this is a truly fast hard disk, with an impressive capacity to boot. IBM has implemented its Giant Magneto Resistive heads into this drive, to increase the areal density and ultimately improve performance. It may not offer the same value for money as the Seagate, but if it's speed you want it's worth a look.

Seagate takes the **Editor's Choice** in the EIDE section, with another Barracuda drive. Again this is a great disk, spreading 28GB of storage across four platters. Like its SCSI cousin, the Barracuda ATA offers excellent value for money, with a cost per GB of only £5.10. It also has installation instructions printed on the casing, making it the most user-friendly device on test.



The Seagate Barracuda 50 offers a massive 50GB of storage spread across 11 platters



IBM won the Highly Commended award for its UltraStar 36ZX SCSI drive



Seagate's Barracuda ATA scooped the EIDE prize for its all-round excellence

The developing world

You may think there's not much in it – four packages from two vendors – but, as Tim Anderson finds out, it's the subtle differences that make or break a development tool, especially in today's web-oriented world.

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• *Visual programming packages reviewed by Tim Anderson.*

There are few choices when it comes to Windows development tools. To be different, you can go to the GNU C++ website – follow the links to the Win32 port from www.gnu.org – and download a free and highly competent compiler, but you will not get the visual tools and wizards that developers now take for granted. Database developers might use a tool such as PowerBuilder or Clarion, which are both good for building well-structured database applications. You can take the cross-platform route and build everything with Java, again starting with a download, from www.javasoft.com. The majority of Windows development work, though, is done with Microsoft's Visual Basic and Visual C++, and Inprise/Borland's Delphi and C++ Builder. Other options have fallen by the wayside. For example, PowerSoft's Power ++, an innovative RAD development tool for C++, has been discontinued, although the highly-regarded Watcom compiler lives on inside PowerBuilder.

This isn't the whole story. Java is big, and there's an array of visual development tools for Java, including Borland JBuilder, Symantec Visual Café and IBM VisualAge. There is little sense, though, in comparing a Java development tool with a Windows development tool, and PCW will look at Java tools in a future article.

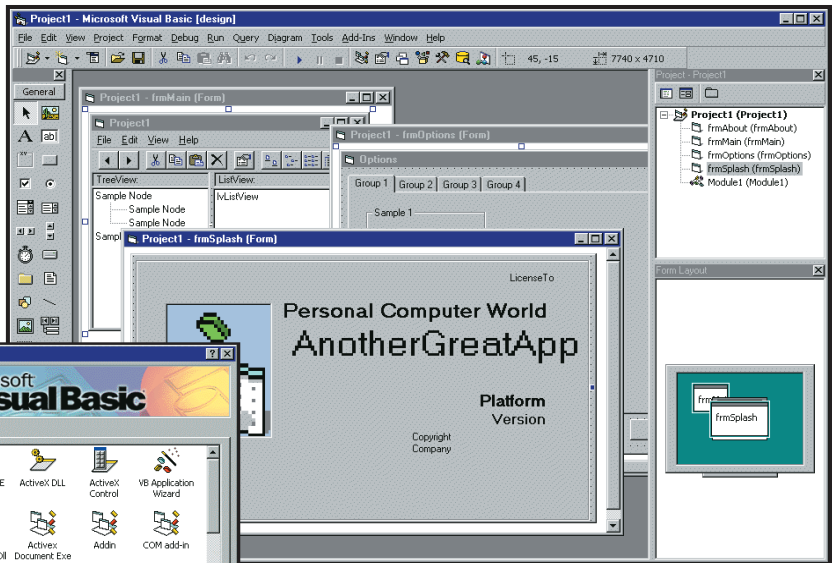
The other change in application development is that multi-tier and Internet development is increasingly dominant. This is the half-way house between cross-platform development and applications that run only on Windows. Web development lets you run native code on the server, but supports any client that can use a browser. Even if all the clients happen to be Windows, it greatly simplifies deployment and maintenance. As a side-effect, development tools are focused increasingly on component-based development with web clients in mind. We have looked carefully at this aspect in the reviews that follow.

Microsoft Visual Basic 6.0

IF YOU WORK with Windows, it is hard to avoid Visual Basic. The core language runtime is used by Microsoft Office as a macro language and by third-party applications such as Corel WordPerfect. The full version is said to be the most popular development tool for Windows, and is used by everyone from hobbyists to corporate development teams building enterprise systems.

What you get is a visual form builder with a palette of widgets that can be extended by installing additional ActiveX controls. Database support is provided by the JET engine, which is the same one used by Microsoft Access. You can also access data through ADO (ActiveX Data Objects) including any ODBC data source. Most Visual Basic controls are data-aware, which means you can hook them up to a field in a database query so that the control automatically shows the current data.

Visual Basic has strong advantages. It is easy to learn, and a novice can build a simple Windows application almost immediately after installing the product. The language is safe, and if you stay with native Basic code, you don't need to worry about memory allocation or pointers, as it is handled for you behind the scenes.



VB's new project wizard shows a rich range of project types

Visual Basic is an old favourite and remains very capable

such as web servers. This feature enables VB to compete as an enterprise

development tool. Through DCOM (Distributed Component Object Model) these components can be executed remotely, so that applications can be partitioned, with developers controlling what runs on clients and what runs on servers. VB is the easiest way to build COM components. All you need to do is

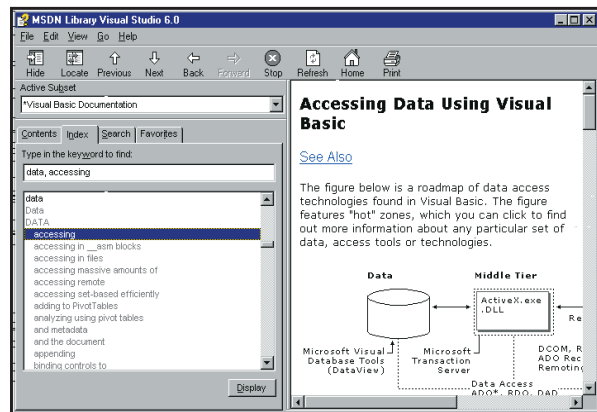
to start an ActiveX DLL project, add class modules for the objects you want to provide, and type in the required properties and methods. Most of the complexities of COM are hidden, although topics such as threading, instancing, and MTS (Microsoft Transaction Server) transactions do require some effort to learn. This is Visual Basic's most compelling feature.

Unfortunately, there are flaws in Visual Basic. Microsoft's efforts to simplify the language can backfire when power users dig deep into the product. Advanced use of the Windows API is easier using Visual C++. Few things are impossible in VB, but some can be convoluted. Another problem is that when you create an object defined by a VB class, you cannot pass it any parameters, making it hard to initialise it

safely. VB doesn't support inheritance either, but in practice this is not a major issue. Advanced developers find VB too much of a black box – errors are hard to track down. Lastly, VB applications can be tricky to deploy because of the large number of files and COM registry entries needed by a typical application.

Visual Basic has special features for web development. DHTML projects create Dynamic HTML pages, hosted within an ActiveX container, in Internet Explorer. Application code is compiled into an ActiveX DLL that runs on the client. Overall, there is little advantage over a conventional Windows application. Webclasses are more interesting. Using Active Server Page technology, Webclasses are ActiveX DLLs that are called by Internet Information Server. The idea behind Webclasses is good, but the documentation is poor, and most ASP developers use other approaches.

Visual Basic is good for beginners, and for creating server-side COM components. For general application development, it's okay, but not the best.



Visual Basic's online help is in HTML, packed with information but slow to search

Third-party support is great, and a web search will turn up a choice of ActiveX controls for all but the most obscure requirements. Documentation is good, and although the HTML help used to present it can be slow, the amount of content makes up for it.

A key feature in Visual Basic is that you can build ActiveX executables and DLLs. These are COM components that can be invoked by other applications

DETAILS



PRICE Learning £91.65 (£78 ex VAT)

Professional £480.57 (£409 ex VAT)

Enterprise £1,128 (£960 ex VAT)

CONTACT Microsoft 0345 002 000

www.microsoft.com/uk

PROS Easy to learn, good database connectivity, strong COM support

CONS Frustrating for advanced developers, use of many runtime files makes deployment more difficult

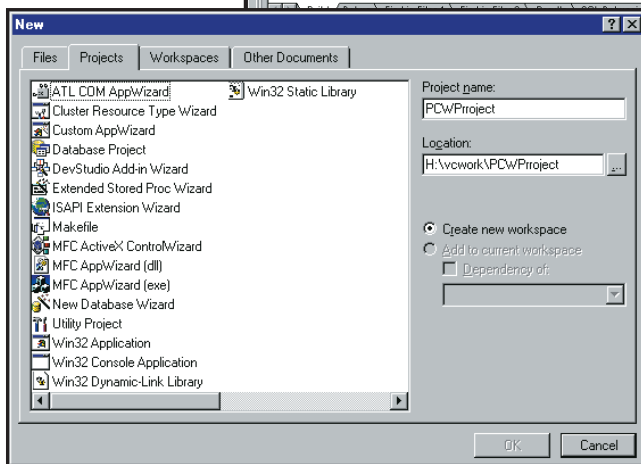
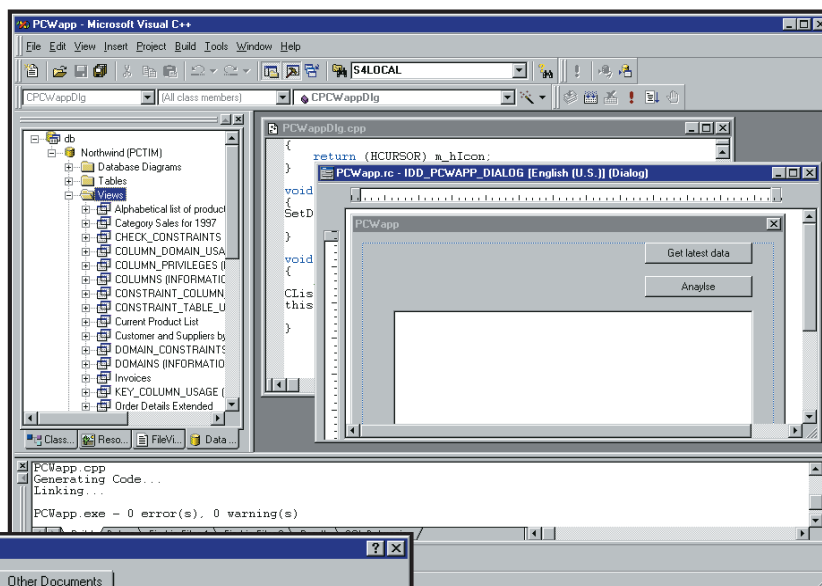
OVERALL Powerful and easy to use, but for many projects Visual Basic is not the best choice

Microsoft Visual C++ 6.0

THIS IS MICROSOFT'S premier development tool and is used internally to create popular applications such as Word and Excel. Whereas the other products in this group test are designed around a visual form designer, in Visual C++ the code editor is king. What you get is a C++ compiler, the MFC (Microsoft Foundation Classes) library, the Active Template Library (ATL) for building lightweight COM objects, and an IDE (Integrated Development Environment) with numerous wizards and tools. Getting started with Visual C++ is made easier by the New Project wizard, which creates skeleton projects, including full Windows applications, dynamic link libraries, ISAPI extensions for Internet Information Server, database connections and ATL COM objects.

Once a project is started, Visual C++ has a high-productivity development environment, provided that you are familiar with both C++ and the MFC. A tabbed workspace window shows different views of the contents of a project, including a file list, class browser, resource list, and for database projects, a database explorer. The code editor has extra features such as List Members, which shows all the member variables or functions for the selected class or structure, and Parameter Info, which shows the parameter list for the selected function. IntelliSense pops up this information as you type, a valuable productivity benefit. The IDE also supports VB Script macros, complete with a macro recorder. It is also extensible by means of add-ins to give extra functionality.

Class Wizard is a tool that automates much of the spadework when working with MFC applications. It will create event handler functions, add member variables to dialogs so that your application can read the user's selections, or edit the COM automation interface for appropriate classes. Working with Class Wizard and the dialog editor is almost as quick as working with Visual Basic or Delphi. MFC itself has a mixed reputation. It was designed to be a thin wrapper over the Windows API, as opposed to Delphi's VCL, which is a high-level



Visual C++ has a fine range of project wizards to get you started

wrapper. The advantage is that you can easily access the whole API. The disadvantage is a steep learning curve and verbose code. The performance of the resulting applications is good, and Visual C++ applications generally run faster than those built with Visual Basic.

For online documentation, Visual C++ uses the MSDN library, as also found in Visual Basic and throughout Visual Studio, Microsoft's suite of development tools. Because it contains the latest version of the Windows platform SDK, this is a near-essential reference for any Windows developer, so to have it supplied with the product is a bonus. The catch with the MSDN library is that it is slow to load, and because it covers several different tools it can be confusing. Early versions of Visual C++, which integrated help as a docking window in the IDE, were easier to use.

One reason for writing code in C or C++ is that compilers exist for most platforms. In September 1998 the accepted standard for C++ was approved by an ANSI/ISO committee. Although Visual C++ has made some progress in supporting this standard, it

The excellent Visual C++ IDE, showing the data explorer and dialog editor

is outclassed in this respect by a number of other compilers, including Borland C++, GNU C++ and Metrowerks Codewarrior. The cross-platform Standard Template Library (STL) is supplied with Visual C++, but it is not the best compiler for STL work. In other words, while Visual C++ is excellent for Windows development, it's less attractive if you want to create applications that compile on other platforms. Applications that call the Windows API cannot be cross-platform in any case, so this may not matter in many situations, although it does diminish the attraction of Visual C++ as a learning tool.

Despite these hesitations, Visual C++ is a delight to use. It has a good editor and the best environment for navigating code. The compiler itself is fast and efficient, and the debugging features are comprehensive. ATL is a breakthrough, enabling small, efficient COM components to be created easily.

DETAILS



PRICE Standard £91.65 (£78 ex VAT)

Professional £478.23 (£407 ex VAT)

Enterprise £1,128 (£960 ex VAT)

CONTACT Microsoft 0345 002 000

www.microsoft.com/uk

PROS Productive IDE, ATL and MFC speed development, array of wizards and tools

CONS Not a RAD tool, weak standards compliance, steep learning curve

OVERALL The best tool for coding to the heart of Windows, but not recommended for novices



Borland Delphi 5.0

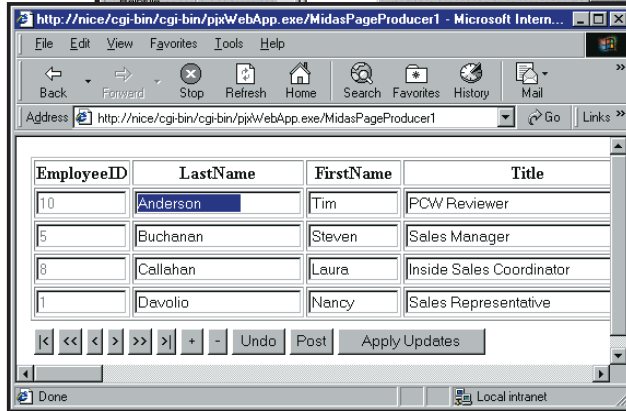
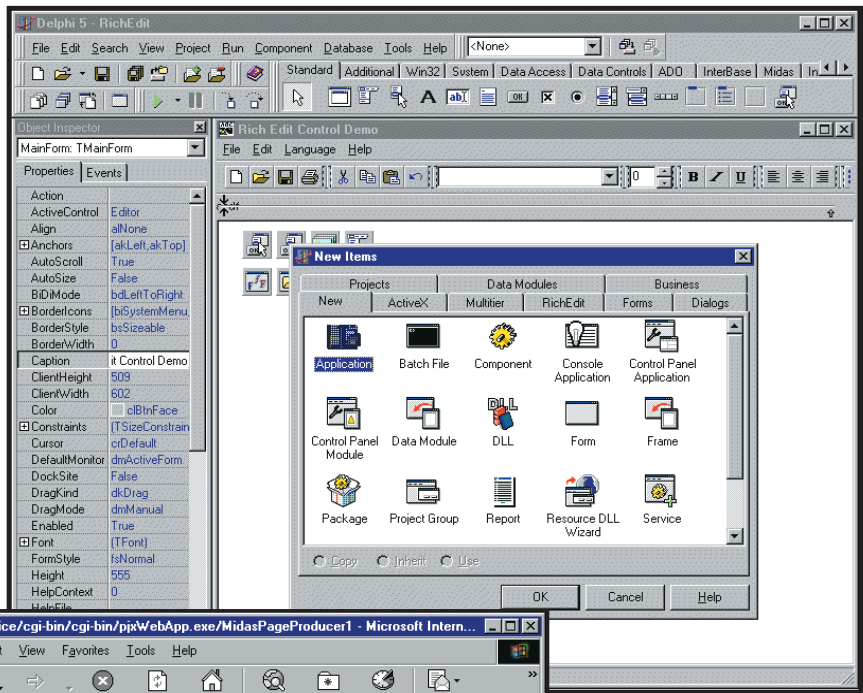
BORLAND DELPHI is a product that has many characteristics of the ideal development tool. The IDE is modelled on Visual Basic, and lets you create applications by placing visual components on a form and setting their properties. The IDE automatically creates event handlers such as ButtonClick procedures, where you can write code to further control the application's components.

So far Delphi sounds much like Visual Basic, but there are important differences. Although the IDE is VB-like, Delphi looks more like a C++ product underneath. It is a full, native code compiler, and you can build applications that do not require any runtime libraries. Most of the source code to Delphi's class library is available, making it easier to track down bugs or to write your own modified components.

Delphi's language is Pascal, modified by Borland to provide full object orientation, including inheritance. The language supports pointers, making it easier to work with the Windows API or other C or C++ libraries. You can build ordinary DLLs in Delphi, whereas VB can only create ActiveX DLLs. Unlike VB, Delphi supports multi-threading. And whereas VB does error handling through a crude On Error Goto statement, Delphi provides exception handling and a 'try ... finally construct' which makes it easier to write safe code. The list goes on, and in essence Delphi has most of the productivity of VB, but without its irritations and limitations.

Visual Basic remains more popular than Delphi, and the reasons are not entirely Microsoft's marketing. Because of its flexibility, Delphi is a little more demanding than VB, and does not provide as much protection from coding errors. There is less third-party support, although some ActiveX components intended primarily for VB will also work in Delphi. Support for COM in Delphi is actually very good, although it does not have the quick and easy route to building COM components that Visual Basic offers. You can do it in Delphi, but there is more to learn.

Another problem area in Delphi has been its database support. Visual Basic comes with the JET database engine and integrates easily with Access and ODBC data sources. Delphi's equivalent, the Borland Database Engine (BDE), works primarily with Paradox or dBase data, and, although ODBC is supported, it is



This web database application is powered by a server-side Delphi web application

The Delphi environment looks similar to Visual Basic, but packs a greater punch

these features, which require expensive runtime licences.

What Delphi users want is an outstanding RAD tool for Windows, and here Delphi has been slow in keeping up with the latest features. For example, ADO was supported in Visual Basic for some time before it arrived in Delphi.

Delphi's Rich Text Edit control doesn't support the latest features of the Windows common control, on which it is based. Such niggles spoil Delphi, but determined developers, with energetic third-party support, always find a way round problems. The latest news is that Delphi for Linux is under development – exciting for those thinking of porting applications.

not the best ODBC client. To get SQL links for popular server databases such as Oracle and SQL Server, you need to purchase the high-end client-server or Enterprise version of Delphi. The situation has improved in Delphi 5.0, which now supports ActiveX Data Objects without use of the BDE, although again this is not supplied with the Standard or Professional edition, but has to be purchased as an add-on.

The core of Delphi is exactly what it should be, but the way Delphi has evolved is, in some ways, disappointing. Borland has put its main effort into pitching for the Enterprise market, by giving Delphi the ability to build CORBA objects, integrating with the Visibroker ORB (Object Request Broker), another product from Inprise/Borland. You can build multi-tier database applications using MIDAS (Multi-tier distributed application services suite), a sophisticated mechanism for sending datasets across a network that supports both COM and CORBA. Good though they are, few Delphi developers need

DETAILS

★★★★★

PRICE Standard £81.01 (£69 ex VAT)

Professional £527.58 (£449 ex VAT)

Enterprise £1,996.33 (£1,699 ex VAT)

CONTACT Borland 0118 932 0022

www.borland.com/delphi

PROS RAD without compromise: the power of C++ and the productivity of Visual Basic

CONS A little slow to support new Windows features. Expensive Enterprise features irrelevant to many developers

OVERALL Any Windows developer should at least consider using Delphi



Borland C++ Builder 4.0

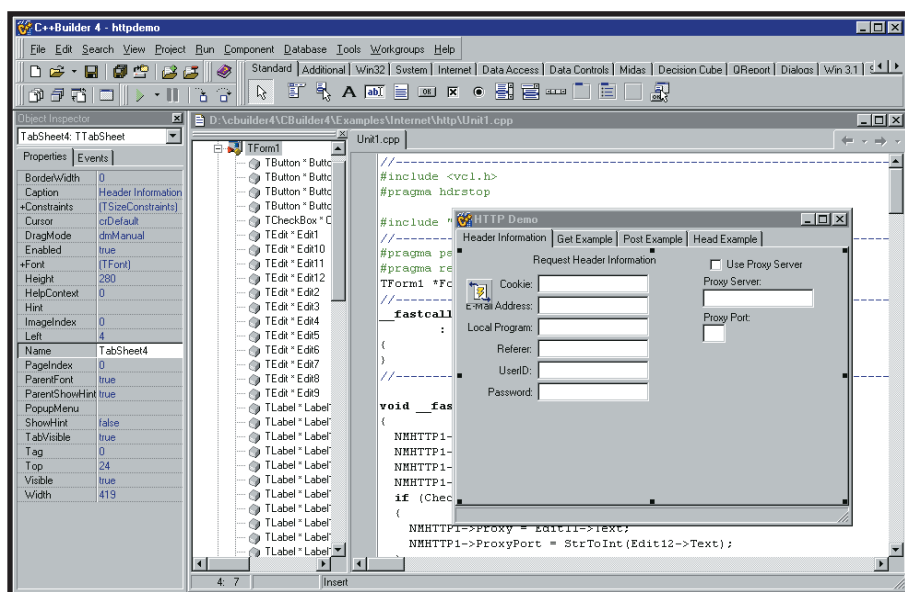
WHEN DELPHI WAS first released, some developers were put off by its language, Pascal, when the dominant language for Windows development is C++. This product is Borland's answer. C++ Builder and Delphi share the same back-end compiler, but Borland has made the Pascal Visual Component Library look like a C++ class library. The developer can work entirely in C++, while benefiting from the same rapid, visual development that Delphi offers.

Most of what applies to Delphi also applies to C++ Builder. The IDE looks almost the same, until you open the code editor and find C++ in place of Pascal. Like Delphi, this product comes with a full range of visual and non-visual components, database access, based on the Borland Database Engine and SQL Links client-server drivers, and support for multi-tier applications, using either COM or CORBA components. Since Delphi additions can easily be converted for C++ Builder, third-party support is similar to that of Delphi.

Borland's earlier C++ product was simply called Borland C++ and was a direct competitor to Microsoft's Visual C++. It had its own class library, the Object Windows Library (OWL). Many developers preferred OWL to MFC, as it does a better job of shielding developers from the intricacies of the Windows API, but MFC

dominated because of Microsoft's support. C++ Builder combines Delphi with Borland C++. Support for OWL is still included, although there is no documentation or tools.

Although Borland C++ has been discontinued, not every feature has been retained. For example, Borland C++ had a macro language for automating the editor and IDE, and a code profiler for optimising performance. Borland C++



C++ Builder 4.0 looks very like Delphi, because it shares the same component library

was a better product for non-visual C++ development. That doesn't mean C++ Builder is poor for general C++ work. It has good support for the Standard Template Library, and Borland is committed to support for ANSI/ISO C++.

C++ Builder will compile MFC and comes with a version of Microsoft's library, but not the latest. You can convert projects from Visual C++ 5.0. Note the visual designers in C++ Builder are for VCL projects, and not applicable to MFC. So Visual C++ is a better choice for MFC work, but the compatibility might be useful to a Visual C++ migrant, or for third-party libraries designed with MFC in mind.

The most compelling reason to use C++ Builder rather than Delphi is that you prefer C++ to Pascal. The Windows Platform SDK tends to assume use of C++, which is another reason to use this product. An example benefit is that C++ Builder creates COM server components using Microsoft's ActiveX Template Library, whereas Delphi cannot use this. C++ Builder is more flexible than Delphi - you can compile both Pascal and C++

code, but Delphi only compiles Pascal.

Despite these strengths, C++ Builder is a compromise. Because the VCL is Pascal, C++ developers will find they have to become familiar with both languages to learn the product in depth. It also makes working with the VCL less intuitive for a C++ developer than if it were pure C++. Another irritation is that new versions of C++ Builder tend to lag behind Delphi. At the time of writing Delphi 5.0 is available but C++ Builder is still at version 4.0, although version 5.0 is in the pipeline. On balance, developers who don't care which language they use are probably better off with Delphi.

Another interesting choice is between Visual C++ and C++ Builder. For a code-intensive project with a simple user interface, Visual C++ is preferable. Using Microsoft's compiler with MFC is also a safe route for those who want to keep up-to-date with Windows. However, using C++ Builder you can snap together a rich graphical interface with database access in a fraction of the time it would take in Visual C++.



Borland C++ Builder is a hybrid Pascal/C++ product that in practice works well

DETAILS

★★★★

PRICE Standard £99 (£84.26 ex VAT)

Professional £527.58 (£449 ex VAT)

Enterprise £1,996.33 (£1,699 ex VAT)

CONTACT Borland 0118 932 0022

www.borland.com

PROS RAD for C++ developers, commitment to ANSI/ISO standards
CONS Uses Pascal class library, lags behind Delphi

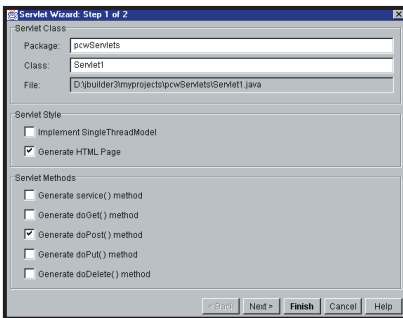
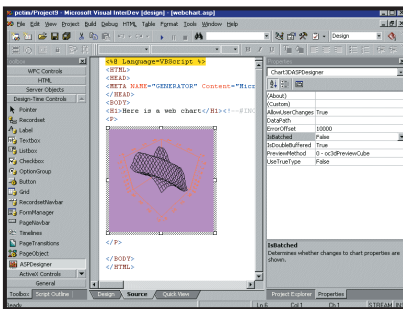
OVERALL An excellent application builder for C++ developers

Developing for the web

The approach to take with web development is to choose the tool that **speaks your language**.

In contrast to the Windows development arena, there is much activity in providing web development tools. Here, the platform is a web server and the client a browser. The complexity of web development is that the different application layers require different languages and tools.

For client-side scripting the de facto language is Javascript, also known as Jscript and EcmaScript. Internet Explorer also supports VB Script, but this has not been implemented by other browsers. JavaScript is not difficult to learn, but the challenge of scripting is programming the API exposed by the browser, which takes the form of an object model. Each browser version presents a different



TOP Visual InterDev is perplexing at first, but offers a comfortable environment for scripting and ASP development
BOTTOM Java Servlets are a great choice for server-side web components that are not limited to Windows

object model, and many developers use Notepad or a programmer's editor to code JavaScript, with a browser reference handy, to get round the incompatibilities. Tools such as Microsoft's Visual InterDev do syntax highlighting, code completion and script debugging for JavaScript, but compatibility can still cause headaches.



Macromedia's Dreamweaver is great for web development, particularly since it comes bundled with Allaire Homesite for text-based editing and scripting

Some web-authoring tools provide libraries of JavaScript functions written with cross-browser compatibility in mind. With Macromedia's Dreamweaver, you can create dynamic web pages while hardly being aware that pre-authored scripts are being used.

The other options for client-side browser development are Java applets and ActiveX controls. There are many Java tools available, such as Borland JBuilder, IBM VisualAge for Java, and Symantec Visual Café, or you can work with Java using a simple text editor and the Java Development Kit (JDK) downloaded from Sun. Java applets are powerful, but not that popular, thanks to variable browser support and slow loading times. ActiveX controls are even less popular, as Windows-only support loses a key feature of web development, and there are security concerns.

At the server end there are several technologies. Microsoft's Active Server Pages is a solution for Internet Information Server that involves server-side scripting in JavaScript or VB Script, and COM components running on the server. Through Distributed COM (DCOM), components can interact with others running elsewhere on the network.

The premier tool for ASP is Visual

InterDev. This provides a visual HTML designer, script editor and debugger, and a clever technology called design-time controls, which partially automates script writing for data access and server-side components. There's a range of tools, including a database explorer, site diagram, style-sheet editor, and a deployment wizard.

A favourite on non-Windows platforms, with similar features to ASP but without COM-component support, is PHP (Hypertext Preprocessor). Its strength is its database support. Functions for accessing numerous database servers including ODBC are available for PHP.

Another web technology is Java Servlets and Java Server Pages (JSP). For these you need an add-on such as Allaire's JRun, or a web server such as Sun's Java Web Server that has integrated support. Java is outstanding for server-side component development. It was designed with the Internet in mind, with support both for databases, through JDBC, and distributed applications through Remote Method Invocation (RMI) or CORBA.

If you want a web development tool, then for ASP go with Visual InterDev. For more general work, Macromedia's Dreamweaver comes bundled with Homesite 4.5 - the best of both worlds.

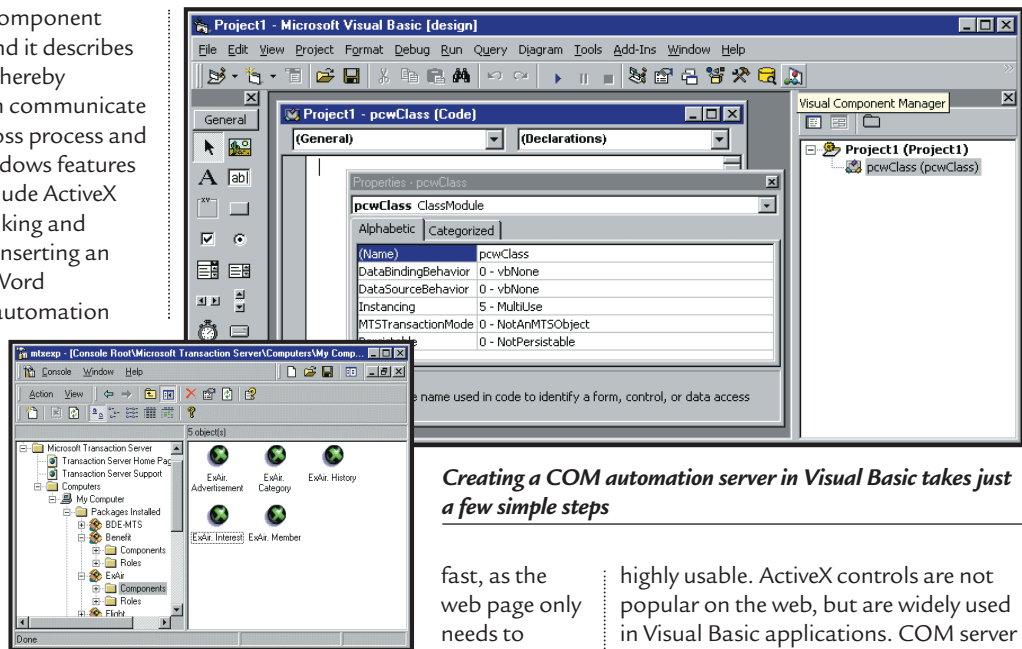
COM and ActiveX

While Windows remains **the mainstream OS**, COM will continue to be the developers' choice.

COM stands for Component Object Model, and it describes the technology whereby software components can communicate with each other, even across process and network boundaries. Windows features that depend on COM include ActiveX controls, OLE (Object Linking and Embedding, for example inserting an Excel spreadsheet into a Word document), and ActiveX automation where one application programmatically controls another.

The power of COM is that it lets you break down an application into components. These components can then be deployed flexibly. Windows DNA (Distributed Internet Architecture) is Microsoft's name for a multi-tier architecture that separates presentation, business logic, and database services. In a web application, for instance, the browser handles presentation, business logic components run on the web server, and data is accessed from a third machine.

ActiveX controls are COM components, designed to be hosted by a container, such as a web page. Once installed on a user's machine, they are



Microsoft Transaction Server plays a key role in COM distributed and web applications. In Windows 2000 it is built into the operating system and renamed Component Services

compiled Windows application. Web users are wary of ActiveX controls, since they run as Windows executables with full access to the client computer, posing a security risk, although controls can be signed for safe identification.

In its early days COM was unreliable but the system has matured and is now

Creating a COM automation server in Visual Basic takes just a few simple steps

fast, as the web page only needs to contain the data for the control. The control itself gives the same performance as any other

highly usable. ActiveX controls are not popular on the web, but are widely used in Visual Basic applications. COM server components have great potential in web applications. Component-based, multi-tier applications are the way forward, although COM itself has rivals. Java supports RMI (Remote Method Invocation) for distributed applications, while Java servlets perform a similar role to COM servers in web applications. CORBA (Common Object Request Broker Architecture) is another approach to distributed applications, more advanced technically, but complex and expensive to implement. In a Windows environment, it's COM that remains the natural choice.

Understanding the Windows API

Windows API (Application Programming Interface) is the programmatic way to control the operating system. When a Windows application runs, it makes thousands of calls to the core Windows runtime libraries, such as kernel32.dll, user32.dll and gdi32.dll. In the early days of Windows, each call had to be coded manually.

Successive development tools have found ways of wrapping the Windows API as higher-level objects, called a class library. In Delphi, the following code creates and displays a window:

```
f := TForm.create  
(Application);  
f.show;
```

(Key: ✓ code string continues)

Some versions of Delphi supply the source code for forms.pas, where the TForm

class is defined. Open that, and you can see the extensive code which executes behind the scenes, including calls to the CreateWindowEx API function that provide the new window.

What this means is that when you choose a Windows development tool you are also choosing a class library. For Visual C++ it is the Microsoft Foundation Classes (MFC). For Delphi

and C++Builder it is the Visual Component Library (VCL). For Visual Basic it is hidden from view, but VB also wraps the Windows API in a high-level, object-based library. These libraries are sub-sets of the full API, so you will need to extend or bypass them occasionally to get at hidden features. This is harder in VB than in the MFC or VCL – a source of frustration for VB developers.

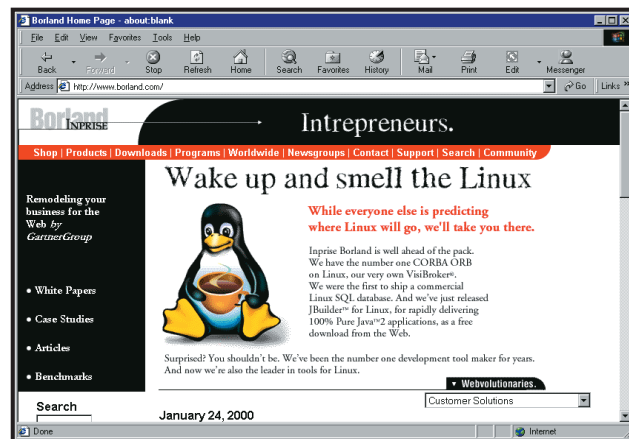


Development futures

While Microsoft is busy with Visual Studio 7.0, Borland is **taking the Linux road.**

During 2000 there will be new releases of both Visual Studio and C++ Builder, and at least an update for Delphi 5.0. Clearly, the priority for both product families is that Windows 2000 is fully supported. Microsoft has produced a certification scheme for the new operating system, which specifies the requirements for well-behaved applications. There are 40 key points in seven categories, and not all of them are trivial to implement. They include installation using the Windows Installer service, proper support for roaming users, careful interface design to support multiple monitors, co-operation with power management schemes, and for distributed applications, Active Directory support.

Microsoft has given some snippets of information about features that will appear in Visual Studio 7.0. Two of the most important additions are web-related. First comes a new kind of form, called a web form. A web form will be an ASP page that calls compiled COM-server components to achieve its functionality. This is ideal for intranet or Internet applications that work cross-platform and without the need to install anything on the client. You can do this with the current Visual Studio, but the difference in Visual Studio 7.0 is that working with a web form is like working with a traditional Visual Basic form. You



Borland embraces Linux: Shrewd marketing, or cashing in?

click to open the code for an event handler, and click the Run icon to execute the application. As VB developers are used to this model, the transition to ASP applications will be easier.

The second new feature is that COM components will be able to communicate via XML, using the Simple Object Access Protocol (SOAP). Provided you have an HTTP connection, you will be able to call the methods and set the properties of remote objects. With XML there is nothing to configure and the quality of the network connection is less critical, provided that the data is delivered. According to Microsoft, Visual Studio 7.0 will make working with XML

interfaces as easy as programming COM objects.

Inprise/Borland aims to reduce dependence on Windows and to support cross-platform development. Kylix is the codename for new Linux versions of Delphi and C++ Builder. How easy it will be to port existing applications will depend both on

Kylix and the application. The Windows API doesn't exist on Linux, and the graphical widgets are different.

The company is also promoting some products by making them free. Alongside the Interbase client-server database, the Borland C++ compiler is to be free for download. This will be command-line tools only, as C++ Builder will remain a commercial product. Another recent development is JBuilder Foundation, a free version of a RAD tool for Java that runs on both Windows and Linux. Clearly, the intention is to make a splash on Linux and obtain a larger user-base, benefiting by selling related products and services.

Visual Studio: The ultimate developer bundle

Microsoft now bundles all its tools into a single suite, although they are still available separately. If you need more than one, the suite is better value than buying separate products. The core products are Visual Basic, Visual C++, Visual InterDev, Visual J++, Visual FoxPro, and in the high-end edition, Visual SourceSafe for source management and version control. The suite is ideal for developers who want to build a front-end in

Visual Basic, calling DLLs created with Visual C++. Another benefit is Microsoft is forced to ensure that the products work together – a tough task, given the number of shared components.

The venerable Visual FoxPro is a database development product whose language is based on the original dBase. It has acquired full object orientation, and FoxPro is now equally useful as a client to a server database as it is

working with its native dBase-like data format. While in some ways better than Visual Basic, FoxPro never managed to lose its image as a legacy product, and has acquired few new developers. It also suffers from large runtime files.

Visual J++ 6.0 is a brilliant product with an uncertain future. It combines Java with a Windows-specific component library, and is the closest Microsoft has come to rivaling Delphi for



productivity. Legal disputes with Sun and the preference of Java developers for cross-platform products may have killed Visual J++, putting more pressure on Microsoft to improve the RAD capabilities of Visual C++.



Editor's Choice

There are several key issues in choosing a development tool. First, power. Visual C++ and C++ Builder are fractionally ahead of Delphi, but not by much. Visual Basic comes in last. Despite being good enough for most tasks, there are still things that you cannot do or cannot easily do in VB. Second, productivity. For the simplest projects, Visual Basic has the advantage, but for projects of even moderate complexity, Delphi is the winner, followed by C++ Builder, Visual Basic and finally Visual C++.

The third factor is ease of use, taking into account the design of the IDE and the ease of learning how to accomplish new tasks. Again, although Visual Basic is easier to begin with, Delphi is the long-term winner. Fourth comes database connectivity. Visual Basic and Visual C++ are better ODBC clients, but now that Delphi properly supports ADO, it is a close call. Overall, Delphi easily

achieves the **Editor's Choice** award.

This has been true for several years now. Delphi's VCL is a generation ahead of both MFC and the black-box approach of Visual Basic. Even though Borland's development of Delphi has been unspectacular, Microsoft has not yet bridged this fundamental gap. The closest it has come is with the ill-fated Visual J++ 6.0, which now appears to be a false trail.

One reason Microsoft has not worried much is that its tools are still more popular. Visual Basic is hard to avoid, being embedded into Microsoft Office, Internet Explorer and, through the Windows Scripting Host, everywhere

in Windows. Visual C++ has a superb IDE and is a comfortable choice if you are using Microsoft's documentation, since it is assumed that you use it. Nevertheless, most tasks can be done more quickly in Delphi or C++ Builder, with very little sacrificed in terms of performance or flexibility.

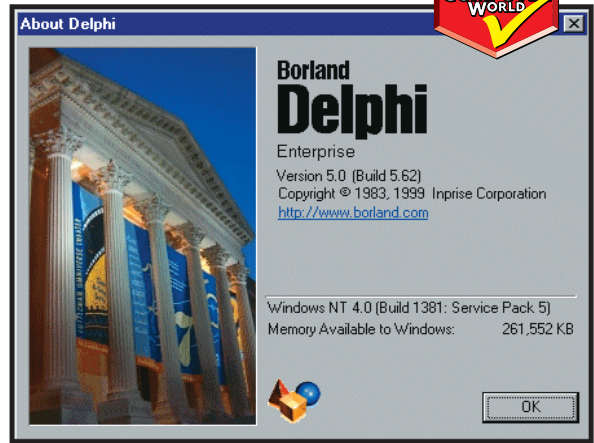


Table of features

PRODUCT	VISUAL BASIC	VISUAL C++	DELPHI	C++ BUILDER
VERSION	6.0	6.0	5.0	4.0
Supplier	Microsoft	Microsoft	Borland	Borland
Tel	0345 002 000	0345 002 000	0118 932 0022	0118 932 0022
URL	www.microsoft.com/uk	www.microsoft.com/uk	www.borland.com/delphi	www.borland.com
Prices inc VAT	£91.65/£480.57/£1,128	£91.65/£478.23/£1,128	£81.01/£527.58/£1,996.33	£99/£527.58/£1,996.33
Prices ex VAT	£78/£409/£960	£78/£407/£960	£69/£449/£1,699	£84.26/£449/£1,699
Language	Basic	C++	Pascal	C++
Native code compilation	✓ with runtime	✓	✓	✓
Native/bundled database engine	JET	JET	BDE	BDE
Report designer	Crystal Reports	None	QuickReport	QuickReport
ODBC support	✓	✓	✓	✓
ADO support	✓	✓	✓ (add-on)	✗
Host ActiveX controls	✓	✓	✓	✓
Easily create ActiveX controls	✓	✓	✓	✗
Supports Active Template Library	N/A	✓	N/A	✓
Create COM servers	✓	✓	✓	✓
Create web server applications	✓	✓	✓	✓
Setup toolkit	Wizard	InstallShield	InstallShield	InstallShield (Not Standard edition)
Windows Installer support	✓	✓	✗	✗
Class/Component library	Built-in	MFC	VCL	VCL/MFC/OWL
Component library source supplied	N/A	✓	✓	✓
Profiler	✗	✓ (Not learning edition)	✗	✗
Scriptable IDE	✗	✓	✗	✗



hands on

Perhaps the only thing that is guaranteed in IT, is that things always get bigger and faster. Take hard disks, for example. They've gone through the roof in terms of storage capacity, and applications with hefty storage requirements – such as digital video-editing – that were once the preserve of the high-end workstation, can now be achieved on mid-range machines.

If our grouptest has tempted you into buying one of the latest hard drives, then this month's **Workshop** [p238] tells you how to cut all that space into bite-sized chunks, by partitioning the drive. Gordon Laing guides you through both FDISK, that ships with Windows, and Partition Magic from PowerQuest.

This month's revamped Hands On section also sees the introduction of our new **Q&A** [p234] section, that gathers together our panel of experts to answer your most pressing enquiries. Also new is **Windows 2000** [p244], where Terence Green shows you how to get to grips with Microsoft's new beast. So don't forget to write in with your questions and tips.

NIALL MAGENNIS, FEATURES EDITOR

NIALL_MAGENNIS@VNU.CO.UK

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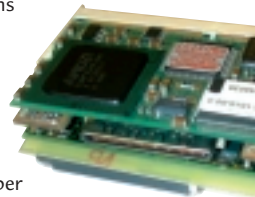
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Question time

Our new Q & A section is here to answer those **niggling quandaries**, as well as tackle the big issues.

Windows

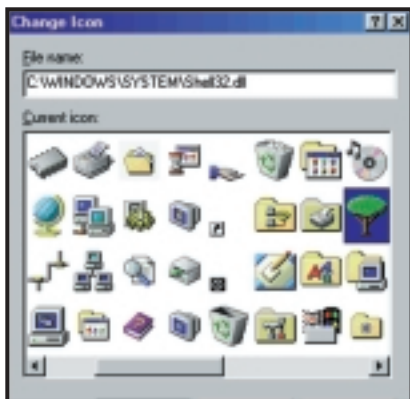
Q I have some .fon fonts that I want to use on my website (as images, not text). However, all the editors I use will only see .ttf fonts. What's the difference between them and how can I get at the .fon fonts?

Peter Inkey via email



Using system fonts in Paint

A TTF (TrueType Fonts) are scalable outline fonts that can be used on screen or printed at any size. FON fonts are bitmapped fonts used by the Windows system (eg the MS Sans Serif used as the default icon title font). These don't scale - they have to include a set of glyphs for each intended size - and when enlarged give a blocky effect. This may be just what you're after, and the good news is that you can access these fonts in Windows Paint.



Tracking down icon numbers

Q A strange thing has happened to the icon for my E: drive, for some reason it has changed from a standard hard-disk symbol to the Windows-flag-on-a-paper sign.

Rupert Gayne via email

A The most likely cause of this is that a file named autorun.inf has been placed in the root of the drive. These files are used by CD-ROMs to store the path to the icon and the path to the default Autorun program, but they also work on hard disks. Delete the file, or if you feel like being creative, open it in Notepad and change its contents so that it reads:

```
[Autorun]
icon=C:\WINDOWS\SYSTEM\shell32.dll,41
(Key: ✓ code string continues)
```

This will give you a tree symbol: you can explore other likely sources by experimenting with any shortcut 'Change Icon' dialog, the icons are numbered from 0, down then across. Alternatively use the Icon Snatcher utility mentioned last month.

Q What are .gid files? McAfee PowerClean tells me they are temporary files that can be deleted, so why are they marked with the Hidden attribute?

Theresa Dunnett via email

A They are indexes to Help files that get built the first time the latter are accessed. You can indeed delete them, but it's a fairly pointless exercise as they will get recreated the next time you open the help file. If it's a big help file, you'll probably have to sit through a 'Preparing help file for first-time use...' message, as well.

Q I've just installed a second hard disk, which has bumped my CD-ROM drive down to E. Consequently, whenever Windows needs to get a file from the CD, it doesn't know where to look. Is there any way I can swap the

letters back, or point Windows in the right direction?

Chris Parker via email

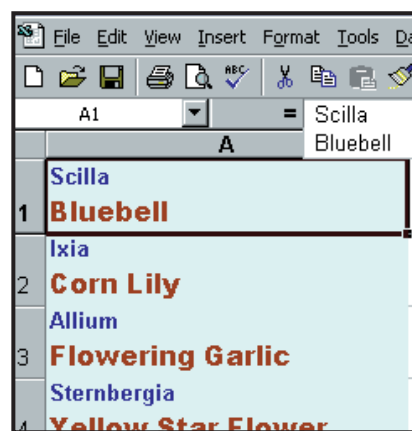
A I'm afraid it's no to the first question, but yes to the second. You need to run Regedit and go to: HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Setup.

Look for a value in the right-hand pane entitled SourcePath and double-click on it. You'll then be able to change the existing value (D:\win98\) to the new (E:\win98\). With the wisdom of hindsight, it's a good idea to leave space for expansion with a new system before you install any applications. In Device Manager, go to the Settings tab on the CD-ROM drive properties. Set the start and end reserve drive letters to a letter further down the alphabet. Redirect the SourcePath as above, then all subsequent installations will be safe from change.

Spreadsheets

Q How can I mix formats in an Excel cell?

Baxter Grant, via email



Mixing formats is easy when you know how

A It's easiest to do this in the Formula Bar. Position the insertion point where you want a line break and press Alt & Enter. Highlight the

first line and format it in the normal way. Repeat with the second line. To select the correct row height, double-click on the line between two row letters.

Q How can I paste data into a group of Excel worksheets?

Derek Clowes via email

A The Clipboard is not available when Excel sheets are grouped, but the Fill facility can be used instead. Click the tab of the sheet containing the data to be copied. Then hold down Ctrl and click the tabs of the sheets to be grouped. Select the data. Choose Edit, Fill, Across Worksheets, OK. Then right-click on any of the grouped tabs and choose Ungroup Sheets.

Q How can I quickly jump to a specific cell on the last sheet in my Excel workbook?

Ian Clarkson via email

A Click on the cell and choose Insert, Name, Define. Give it a Name and click Add, then OK. On any other sheet, you can now click the down arrow in the Name box (that can be found at the left end of the Formula Bar) and choose that Name.

Q How can I transfer an Excel Custom List from one workbook to another?

Julie Williams, Middlewich

A On the same machine, there's no need to do this. The list is stored in the registry and is available whenever you open Excel. On another machine, you need to go to the Tools menu and choose Options, Custom Lists. Click the 'Import list from cells:' arrow and highlight the list on a floppy disk file or via a network connection.

Word processing

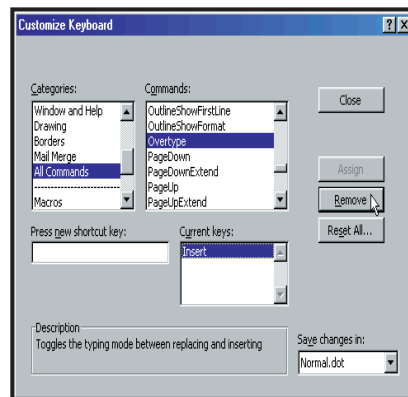
Q I'm sure that when I have used Word previously, it included a File Menu option to Close All Files, but leave Word running. This seems to have mysteriously vanished on my Word 97 system.

Diane Brandley via email

A If you hold down the Shift key as you open the File menu, you'll see that it mysteriously reappears. You can also add it to the standard menu if you go into Tools, Customise.

Q I hope you can help me with an annoying Word 97 problem that occurs often and unexpectedly: as I type, the program suddenly goes into overtyping mode, and begins deleting existing text as I edit. I then have to open Tools, Options, Edit and remove the check from the overtyping box.

Paul Guglielmetti via email



Disabling the Overtyping toggle key

A It sounds as if you are hitting the Insert key by accident, which toggles Overtyping on and off. It's possible to disable this from Tools, Customise, Keyboard. Choose All Commands on the left, and Overtyping on the right - you can then remove the keyboard assignment.

Q I have a picture with a plain white background and I would like to insert this into Word 97. The effect I am trying to create is to get the text to wrap around the outlines of the picture itself. Despite a great deal of fiddling with the Format Picture options, I can only get the text to wrap around the rectangular background.

Colin Wiley via email

A The easiest way to accomplish this is to use an image-editing program, such as Paint Shop Pro or Photoshop. Set the white background as the transparency colour and save the picture as a .gif file. You'll then find the Tight Wrapping Style option does what you want.

Hardware

Q I'm considering buying an Iomega Zip 250, but would like to use the drive between three machines. The first has a parallel port, no SCSI and no USB. The second has parallel, SCSI, but no USB. The third is a relatively new PII 400 that has parallel and USB but no SCSI.

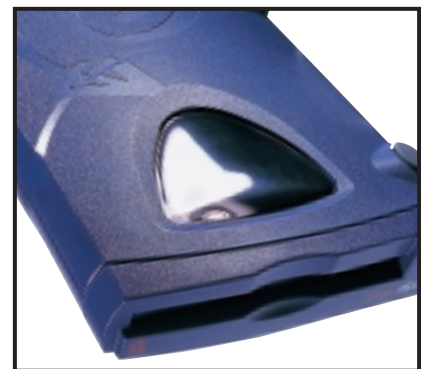
I am under the impression that the USB zip is substantially faster than the parallel zip. I have seen parallel-port-to-USB-port converters, but nowhere have I seen speed comparisons of native USB zip versus parallel-converted-to-USB zip - do you have any idea how they compare?

Also, will the forthcoming USB2, running at 480Mbps/sec, be backwards compatible with USB1?

Steve Wood via email

A A native USB device will run considerably faster than one connected to a parallel port. Even if you use a parallel-to-USB adaptor, you'll still be limiting your USB device to the much slower parallel port. For the ultimate in compatibility and performance, I'd recommend you buy a USB zip drive, and fit USB ports to your non-USB PCs, using a PCI card costing around £30 from Entegra. If you can't or don't want to fit this card, it would still be best to get the faster USB drive and use parallel converters for your non-USB systems. Their parallel ports will limit its performance, but at least it'll be quick on your USB PC and any future systems.

The USB forum says that USB2 peripherals will work on USB1 ports, although at the lower USB1 speed of 12Mbps/sec. USB1 peripherals are also said to work on a USB2 chain, although again at the lower speed of 12Mbps/sec. The forum also says mixing USB1 and USB2 peripherals on a USB2 chain won't



A USB Zip 250 is a safe bet



compromise performance of the faster devices, although we'll wait and see when USB2 arrives later this year.

Q PCW recently mentioned that Celeron PPGA 366 processors can be run with Front-Side Bus (FSB) speeds of 100MHz - to achieve an over-clocked 550MHz processor speed. I have just upgraded one PC to a Celeron PPGA 433MHz processor and another to 400MHz, does the same principle apply?

Lewis Delgado via email

A The theory works, but unfortunately the practice probably won't. The Celeron 400 and 433 processors use fixed clock multipliers of six and 6.5 times their intended FSB of 66MHz. Upping the FSB to 100MHz would therefore overclock them to 600 and 650MHz respectively, both of which are sadly beyond the capabilities of the process used to create them.

If your motherboard supports intermediate FSB settings between 66 and 100MHz, you may wish to experiment, but remember these may be running the very picky PCI and AGP buses at non-standard speeds. Bear in mind that you'll also need memory rated at 100MHz.



Celeron 433s can't really be over-clocked

Databases

Q I have an Access database that now holds over 150 phone numbers and addresses. Is it possible to design some sort of search form or program that will find the first few characters of the surname, telephone number or address?

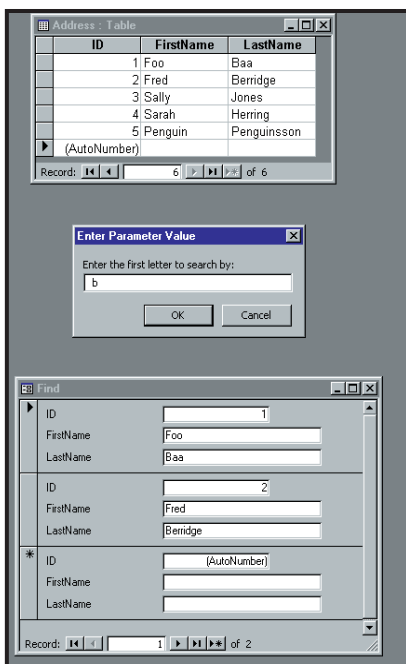
For example, if I type jac I get the results: jackie, jackson, jackson.

Matthew Andrew via email

A One way is to create a parameter query that uses:

Like [Provide the first few characters:] & "*"'

This query works as desired. You can then create a form based on the query. When you open the form, the dialog will ask for the characters and then provide the matching records in the form.



Parameter queries in Access

Unix

Q I've recently got my new system up and running, and have added such essentials as an Internet-connected modem, sound and a printer. Using Linux has saved me money - not just on the price of the operating system, but also because I don't need the very latest processor and a ton of memory to run the software.

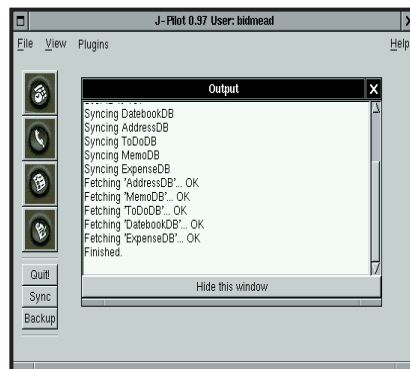
In honour of this I'd like to 'reward' my machine by buying it something extra. I thought of a Zip drive, a writable CD drive, an LCD monitor or a Palm Pilot (I hear there's software available to connect this to a Linux system). What would you recommend?

Bobby Smith via email

A We'd recommend none of the above. Of course, they'd all be nice, and when you do get around to it there is a very tasty software package, J-Pilot, to connect a Palm Pilot to Linux. Written by Judd Montgomery (judd@engineer.com) you can

download J-Pilot free from the website at: <http://jpilot.linuxbox.com>.

But from your description something that we'd judge to be essential is missing. You don't have any form of backup.



J-Pilot can connect a Palm Pilot to Linux

By the way, that Zip drive isn't backup, and neither is the CD-RW, despite what the adverts may tell you. You need tape, because you require:

- Capacity that matches or exceeds your hard-disk drive
- A per-gigabyte price that makes it a no-brainer to back up all the time.

Sure, tape backup is boring. You could spend £400 on a DAT drive and have absolutely nothing to impress your friends with. But if you decided to be first on your block with that LCD screen instead, you might also sooner or later end up with irretrievably lost data files and/or crocked system executables. In the end, it's your choice.

PDA's

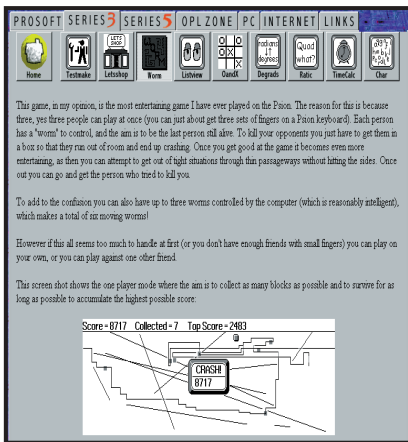
Q We are a family that has recently bought a second-hand Series 3 computer. We want to know if it is possible to get a game we can all play on the machine at the same time.

The Johnson family via email

A At first we thought you were completely mad, as the Psion Series 3 is a Personal Digital Assistant; with the emphasis on personal. As such it has just one keyboard, so how can you possibly expect to find a multi-player game for it?

But when we trawled the web before replying, we actually found a multi-user game for the Series 3 at www.prosoft.force9.co.uk/series3/worm.html.

Apparently up to three people can each use part of the keyboard to drive



Worms: Fun for all the family

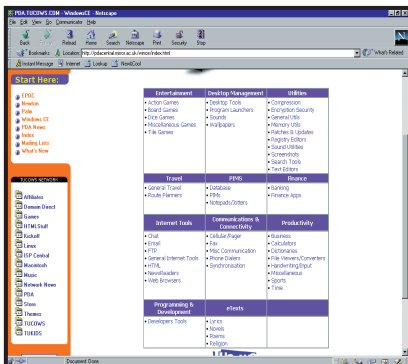
their worm around the screen. We've checked and there are four members in the Johnson household, but they are happy to take turns keeping the score.

Q You gave the address of a good site for PDA stuff a while ago as <http://hensa.pdacentral.com>. This seems to have disappeared.

Brian Ellison via email

A You're right, the site has vanished. Our memory of this site is that it is academic-based, so on the off chance we tried www.hensa.ac.uk and that redirects to www.mirror.ac.uk and ultimately to <http://pdacentral.mirror.ac.uk>.

There, in all its glory is the site, now revamped with even more goodies.



PDA Central is back!

Windows 2000

Q I'm perplexed by an apparent contradiction between comments by Gordon Laing and Terence Green on the subject of symmetric multiprocessor (SMP) support in Windows 2000.

Gordon Laing says it is necessary to have applications which recognise the dual processors like Photoshop. But Terence Green says that 'simply moving an application from Windows 98 to a W2K dual-CPU system has a dramatic performance effect. No changes to the application are required...' Who is telling the truth?

Steve Holmes via email

A Windows 2000 multiprocessing is symmetric, which means that work is allocated by the operating system to whichever processor is available at the time. When Windows 2000 schedules (allocates resources to applications and the operating system) it does so in units of work called threads. With the exception of part of the operating system kernel - which always runs on the first CPU - Windows 2000 schedules threads on the next available processor.



The wonders of multi-processor systems

Windows 2000 itself is multi-threaded and most Windows NT applications have at least a few threads. High-end graphics and engineering fields typically have multi-threaded components, especially if they have been written to run on Windows NT or Windows 2000.

It's very dependent on the specific workload at any point in time, but a higher degree of multi-threading enables Windows 2000 to distribute work more efficiently among the available processing resources.

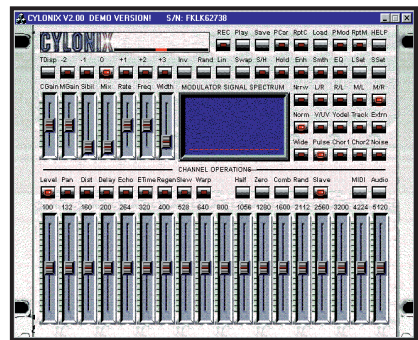
Audio

Q I am interested in being able to record relatively small samples of voice (up to say 30 seconds) and then impose special effects over the top to develop alternative character in the voice.

Please could you let me know if you're aware of a suitable package that is capable of doing this.

Jon Gregory via email

A For robotic-type voices you could try a piece of shareware software called Cylonix, that produces a vocoder effect similar to the sound of the Cylons in *Battlestar Galactica*. It



Cylonix allows you to sound like a Cylon

works in real-time and a demo version is available from the website at: www.cim.mcgill.ca/~clark/cylonix.html. However, it will cost you around £32 to register the software to save the output.

An alternative offering is Voice FX, which can be found at www.synoptic.net. This includes a whole range of sound effects, such as reverb, vocoder, alien and flanger. It costs around £43, but will give you a broader palette of sounds.

Q A while ago you mentioned a small program that allows you to use VST plug-ins in audio editors that only support DirectX plug-ins. Can you tell me what it was as I can't find the name of it anywhere.

James Clarke via email

A The program is called Amulet, it costs £18.80, and is now located at www.fxansion.com.

However, an alternative product has been released by Spinaudio. It's called VST DX Wrapper, is completely free, and is available as a download from: www.spinaudio.com/products.html.

CONTACTS

All of our experts welcome your queries, simply respond to the appropriate address at the end of their Hands On columns.



Memory blocks

Divide and rule, they say, and Gordon Laing reveals the benefits and the 'how to' of partitioning.

In order for your PC to know where to find information on a hard drive, the disk must first be partitioned, then formatted with the desired file system. Normally most hard disks contain a single partition which occupies the maximum space, and hence provides the largest possible single volume – a 20GB hard drive would therefore provide a 20GB volume and that would be that.

However, there's no reason you couldn't split this drive into multiple partitions – a 20GB hard drive could consist of four 5GB partitions for example, allowing you to keep track of where you store specific data, such as work in one and games in another. You

could also put Windows 98 on one, Linux on another, and choose which operating system you'd like to run when powering up your PC.

Partition flavours

There are three types of partitions: primary, extended and logical. You can have up to four partitions per hard disk – all could be primary partitions, but only one can be an extended partition.

The extended partition, however, acts as a container for multiple logical partitions. In theory you can have as many logical partitions as you like in an extended partition, although the alphabetical drive letter convention used by PCs limits you to a total of 24 volumes – A and B are reserved for floppies.

So which type of partition should you use? Most operating systems demand to boot from a primary partition, located within the first 2GB of the first hard disk. So, if you've only got one hard disk, the first partition must be an 'active' bootable primary, which your PC will refer to as volume C.

If you just want to keep certain files on a separate volume to your main OS, use extended and logical partitions. A 20GB hard disk could be partitioned into an active 10GB primary for the OS, and the rest devoted to an extended partition; this could be subdivided into two 5GB logical partitions. You'd then have a 10GB C drive, 5GB D drive and 5GB E drive.

The drive letters can get confusing, particularly with multiple physical disks.

The first visible primary partition of each disk is lettered first, so if you have two disks, each with a primary partition, then they become volumes C and D respectively. Next the extended partitions are taken a disk at a time. If the first disk had an extended partition with two logical partitions, these would be labelled as volumes E and F. Note that your CD/DVD-ROM drive follows the hard disk volumes, and would therefore become drive G in this case.

It's equally confusing for your OS, which may have installed an application from the CD-ROM drive while it was volume D, but post-partitioning now needs to be told to look for G instead.

File systems

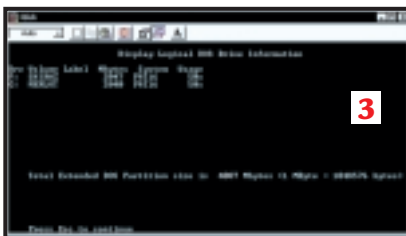
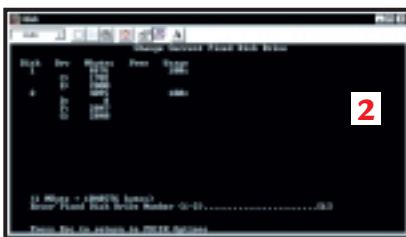
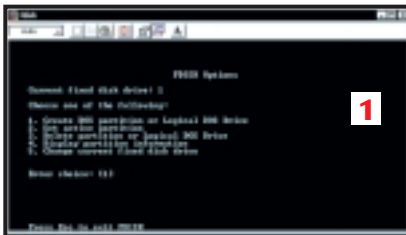
Once you've created your partitions, you'll need to format them with a suitable file system. The most common is the basic 16bit File Allocation Table, FAT16, which is supported by DOS, OS/2, Windows 3.x, 95, 98, NT and 2000. Great for volume compatibility on multi-boot systems, but FAT16 can't handle volumes larger than 2GB, and at that size, its cluster size becomes inefficient. Consequently, a 20GB drive would have to be partitioned into 10 2GB FAT16 volumes (screenshot 3).

Enter FAT32, with improved cluster efficiency and volumes of up to 2Terabytes (2,000GB). Windows 98 supports FAT32, as does Windows 95 OSR2 and Windows 2000. However, DOS and NT (up to and including version 4), cannot see a FAT32 volume. Alternatively, there's the increased security and recovery of NTFS, but it can only be seen by Windows NT or 2000. Then there's HPFS, dedicated to OS/2 and early versions of NT. Linux uses its own file system, too.

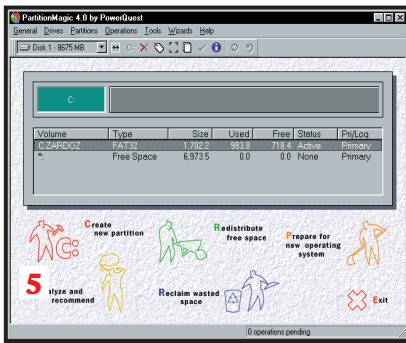
Clearly you should think carefully about which file system to choose when formatting a volume, particularly if it's a logical partition which is to be shared between multiple operating systems.

WARNING!

Partitioning and formatting a disk will wipe it clean. Before proceeding with any



1. The main FDISK options. Note the fifth option only appears in systems with more than one physical hard disk
2. Displaying the partitions on a PC with two disks. Note that primary partitions are always lettered first, so the primary on this second disk is drive D, forcing the logical partition on the first disk to become E
3. This disk has one extended partition containing two logical partitions. Note the FAT16 file system forces this 4GB disk to be partitioned into a pair of 2GB volumes
4. The same 4GB disk, but now using FAT32 allows a single 4GB partition



of the following, ensure you've backed up any essential files and documents.

Adding a new disk

Microsoft's partitioning utility is called FDISK, and it runs from the DOS command prompt or from a DOS Window. You'll first be asked about large drive support, which is effectively asking whether you wish to use the FAT32 file system or FAT16.

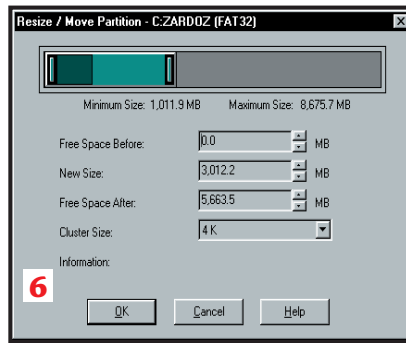
To partition a new second disk, choose option 5 to change current fixed disk drive, (screenshot 2). Select disk 2, then choose option 1 from the main menu to create a new partition. If you're just using it for data, choose option 2 for an extended partition and key in the size you want it to be. Next you can create logical partitions within this, either one big one, or several smaller ones.

When complete, you'll need to restart your PC, after which you'll have to format your new drives, using either the DOS Format command, or by right-clicking the volume in Windows 95 onwards; if large drive support was activated, the file system will be FAT32, although NT and 2000 will also give you the option of NTFS. Note that your CD/DVD-ROM drive will have shunted backwards at least one letter.

Resizing partitions

FDISK can't resize or move partitions to make room for any more. If you don't want to delete partitions and start from scratch, then check out PowerQuest's PartitionMagic. Using a graphical Windows interface you can merrily resize and move partitions, along with creating new ones with great ease, (screenshot 6). It also lets you create several primary C partitions and hide them from each other, which is great for multiple boot systems.

BootMagic is included which allows you to install and switch between multiple operating systems, by presenting you with a menu on first power-up. You



can even convert one file system to another – quite literally magic!

Dual booting with NT

You may not need BootMagic however. Windows NT 3.5x onwards comes with NT Loader, which can multiple-boot between various Microsoft operating systems. Remember that Microsoft OSs demand that certain system files are installed within the first 2GB of the first hard disk, so you'll have to choose a file system on this first C partition that your chosen OSs understand. Consequently, NTFS is out (apart from dual booting NT and 2000), and FAT32 is only possible if dual booting Windows 95 OSR2/98 and 2000. You will also need the bootable setup disks for both operating systems, either as floppies, or CDs if your BIOS can boot from them.

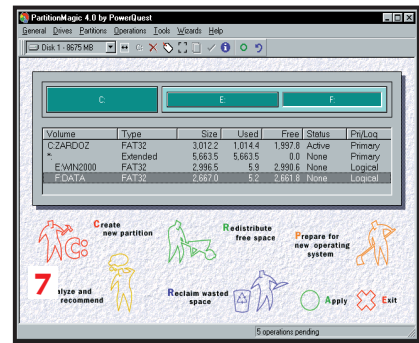
You should have at least two

You can merrily resize and move partitions, along with creating new ones with ease

partitions, a primary C for your first OS and portions of the second OS, and a logical D partition for the bulk of the second OS. You may also want to have a third logical partition for sharing common data between both OSs – (screenshot 7).

Windows 95/98 prefers to live on the first primary, so install it on volume C. Once installed, insert the NT/2000 CD and run the setup. Ask for a clean installation and choose to install it on volume D. Once the installation is complete, the NT Loader will give you the option at startup of booting into one or the other OS. NT refers to your 95/98 installation simply as Microsoft Windows. You can rename this by editing the hidden BOOT.INI file on your C volume.

All is fine until you want to upgrade or reinstall one OS. Reinstalling NT/2000



5. Displaying partition information for disk 1. Note this 8.6GB disk contains just one partition, a 1.7GB primary containing Windows 98. The remaining space is free
6. PartitionMagic uniquely allows you to change the sizes of partitions. Here the 1.7GB primary is extended to 3GB, leaving 5.6GB remaining on the disk
7. The remaining 5.6GB is turned into an extended partition containing two logical volumes of 3GB and 2.6GB. The first, volume D, is used to install Windows 2000, and the second, volume E, for data shared between the two OSs. Note that all three partitions use FAT32, and hence are visible to each other

retains your multi-boot options, but reinstalling 95/98 will remove NT Loader and set itself as the exclusive OS on your PC. To recover your multi-boot option, you'll need to boot off your NT/2000

startup disks, and choose the Repair option. To repair the Master Boot Record, choose only to inspect the boot sector. Once completed, remove the setup disk, reboot, and your multi-boot loader, along with NT/2000 should be back – phew!

Linux and BeOS also come with dual boot facilities, which, like NT Loader, allow you to check out a new OS, keeping your existing one as familiar backup.

CONTACTS

Gordon Laing welcomes your feedback. Contact him via the PCW editorial office or email hardware@pcw.co.uk
PartitionMagic 4: £43.48 (£37 ex VAT)
DABS Direct: 0800 138 5194,
www.powerquest.com



Natural resources

Tim Nott reveals a **mine of curiosities** on the Windows CD-ROMs and has a few tricks of his own.

The Windows Resource kit is one of the hidden treasures of both the 95 and 98 CD-ROMs. In Windows 95 it takes the form of a help file (Admin\Reskit\Win95rk.hlp). In Windows 98 it can be found in Tools\Reskit\Help\Rk98book.chm.

You can copy this to your hard disk – or open it in place. However, if you've got 11MB of disk space going spare, you are far better off installing the entire kit, by running Tools\Reskit\Setup.exe. This gives you not only the 3MB book – to which I'll return – but also a multitude of other (more or less) useful goodies, all gathered together under the umbrella of the rather strange Microsoft Management Console.

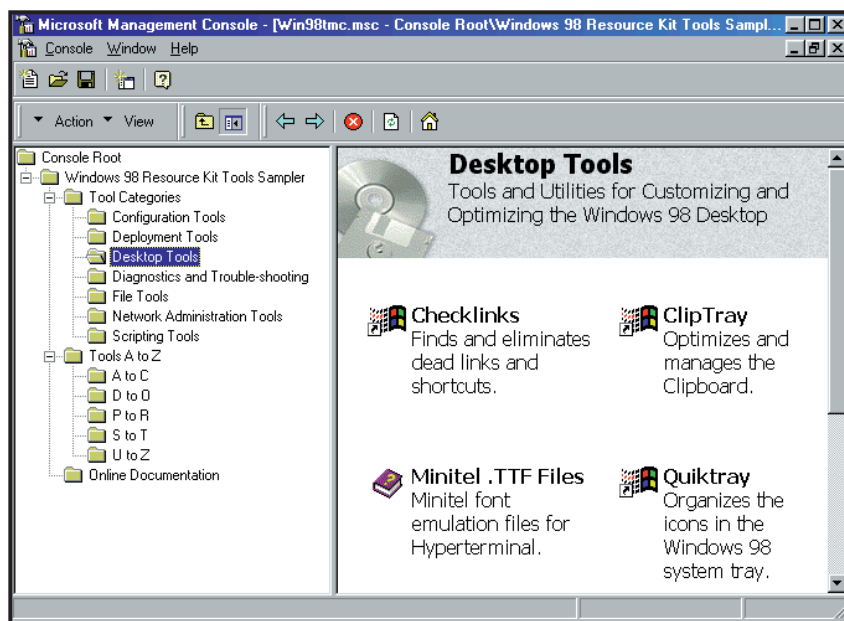
Starting with the less useful, the fonts for French Minitel emulation in HyperTerminal take the prize for utter futility. I mean, really. I live in that country, and I've never used them. Still, it's good to support Europe, and let's hope they bewilder Americans even more than they do us.

Next in the sheer lack of excitement stakes is a text-file viewer. Its good point is that you get a two-paned view, with a browser tree in the left-hand pane. Its bad points are that, like Notepad, it can't manage anything bigger than around

The fonts for French Minitel emulation in HyperTerminal take the prize for utter futility

60KB, and – worse still – it won't wrap text to its own window.

Also high on the not-terribly-exciting list, is Quicktray, which lets you run programs from icons in the system tray. Personally, I use the Quicklaunch bar for doing this and wage an unending struggle trying to keep rubbish out of the system tray. Remind me to have a little rant about this soon, but I will make an exception for Cliptray, another resource kit tray contender, which lets you store multiple text items for instant clipboard retrieval.



The strange world of the Microsoft Management Console

Not all the utilities are installed automatically – you need to go back to the CD to install PWLEDIT.EXE, for example. This rather useful little tool has but one purpose – it removes cached passwords from a PWL file. So, if you've ever clicked an option for Windows to 'remember this password' and subsequently regretted doing so, perhaps

for security reasons, this is the tool to undo the damage. Note that you cannot see the actual passwords, only the service they apply to, so it's quite secure in itself.

Many of the other tools are specialist or aimed at network supervisors, such as the utility to change the DOS code page or create batch scripts for multiple Windows installations.

POLEDIT has made previous appearances in this column – it is used to enforce system policies which can restrict some or all users in various ways, from limiting Control Panel access, to only

allowing certain programs to be run. It's a favourite with network administrators, particularly in schools.

Another rather useful utility is the File Information tool, which lists every Windows 98 file, where it should be installed, which CAB file it comes from on the CD and, in some cases, a description of the file. A must for the terminally curious, this turns up several surprises, such as the 'hidden' Windows 98 TrueType fonts, and the fact that Windows 3.1 Cardfile still ships with Windows 98!

The Time Zone Editor isn't quite as exciting as its *Dr Who*-like name suggests, but it is useful if Microsoft has got the spring and autumn clock change dates wrong for your country. There's WHERE – a DOS-based file finder, and WINDIFF, a rather bizarre tool for comparing files and folders. There's also a USB troubleshooter, a FAT 32 partition converter, as well as Checklinks, which – as I mentioned last month – weeds out dead shortcuts.

Star of the utilities is TweakUI – but only with Windows 98 First Edition. Microsoft removed it from Windows 98 SE, presumably in case anyone hurt



themselves with it. Regular readers will need no introduction to this, but if you're new to Windows or have only just returned from another planet, then this is a Control Panel item that lets you customise and repair various aspects of Windows in ways that would otherwise need recourse to registry editing.

Don't overlook the Resource Kit Tools Sampler Help File (pew). Not only does it tell you what all these tools do (how do you think I found out?) but it also sports a rather good glossary.

A bigger and better glossary is in the Resource Kit Online

Book itself, so next time an attractive member of the opposite sex walks up to you at a party and says 'Tell me all about Drive Parameter Blocks', you'll be able to. Although the book is aimed mainly at network and IT professionals, with lots about 'rolling out' and supporting Windows in a corporate environment, there's a wealth of information for the small business or standalone user.

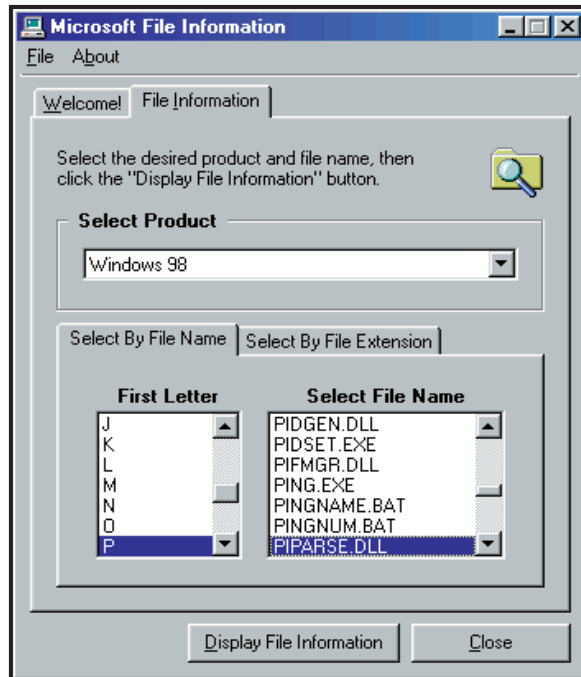
It tells you all you want to know about things such as system policies, networking protocols, the registry, Webcasting and the Active Desktop. There's a good range of troubleshooting and tuning guides, plus a list of every Windows keyboard shortcut known to mankind.

If all this leaves you hungry for more, then there's a grown-up version of the resource kit, with a printed book and extra goodies, such as an animated cursor-editing kit (I want! I want!) available from Microsoft Press.

URL history mystery

Chris Giles was rather surprised to find a 'repository of URLs that I visited a year or more ago hiding on my hard drive'. These were listed in a file named MM256.DAT with a date of 17/12/98. Moreover, the file wasn't visible in Windows Explorer, but did appear in File Manager.

The short answer to this puzzle is that the way Internet Explorer keeps its history



The file information tool lets you find an interesting file...

and cache has changed over the last two versions. As far as I can remember, the MM256.DAT and MM2048.DAT formats belonged to IE3: version four replaced these with INDEX.DAT files, and IE5 split these into daily/weekly subfolders.

Exactly three years ago, I reported in this column that clearing the IE3 History still left old URLs visible, if these files were loaded into a text editor. IE5 seems better, but I still found URLs in the main INDEX.DAT file even after clearing the History.

There's a similar problem with the cached files kept in the Temporary Internet Files - once again, this may appear to be empty apart from a load of cookies (depending on how you access it), but examining things in File Manager shows a different story.

Once again, there's more (and less) than meets the eye. For a start, the Temporary Internet Files folder appears as Tempor~1, which is a limit of File Manager's 16bit legacy. Within that folder are no cookies (the ones you see in Explorer are actually in the Cookies folder), but in the CONTENT.IE5 subfolder there is again an INDEX.DAT file,

which may contain URLs even though the cache has been cleared.

The cached files themselves are stored in several randomly-named subfolders of CONTENT.IE5, and I've found that an IE or Windows crash leaves files in these that turn into super-mutants beyond the reach of the IE properties Delete Files button. Should this happen, you can open each of the randomly-named folders in File Manager and delete all the contents except DESKTOP.INI.

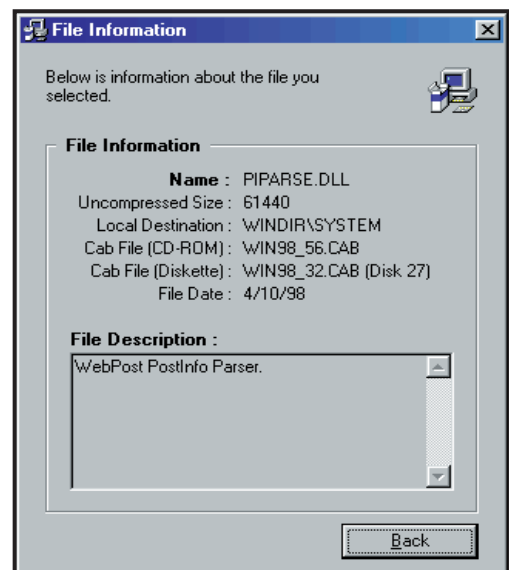
For a more drastic solution (which will also purge the INDEX.DAT file, restart in MS-DOS mode and use the DELTREE command to get rid of the Temporary Internet Files folder and all its contents. IE will build a fresh set next time it is started.

Assorted tips

It's an old one, but a good one, and thank you, Benedict Prescott, for reminding us. Rather than juggle with the two-click timing, or waiting for the right-click menu, to rename a file, just hit F2.

And another fine tip, this time from Peter Bradley, concerns defragging. I mentioned in February's column the necessity to close down invisible programs before running defrag, in order to avoid the maddeningly iterative 'drive contents changed, restarting...' message.

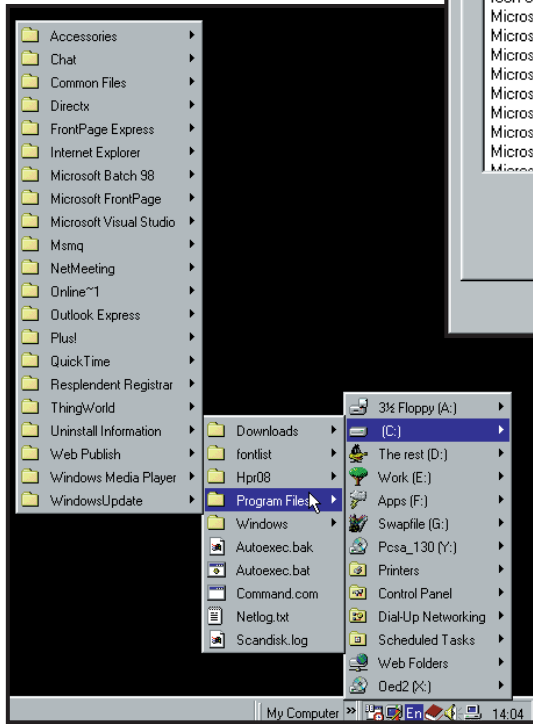
Peter pointed me to a file on the Windows 98 CD-ROM to solve this problem. It's called defrag.inf and lives in the Tools\mntutils folder. Right-click on it and select Install. Nothing appears to happen, but in fact it writes to the



...and check what it does

registry. If you don't have the CD to hand then you can DIY by going to: HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\RunServicesOnce and add a new string value with the name Defrag and the value DEFRA.GEXE/ALL.

Now, note that you must have a login enabled for this to work, so if you don't,

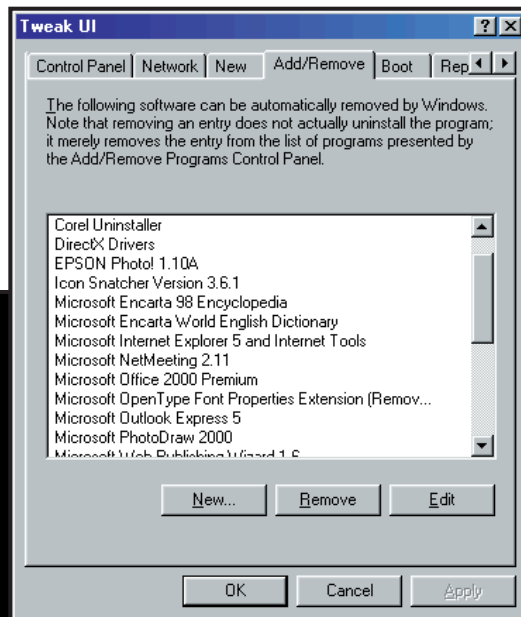


Ease navigation by making a menu of your file system

enable multiple users, or give yourself a password as a temporary measure. Restart the PC, and when the login prompt appears do nothing. Defrag will then start and do its thing before anything else is loaded, and when it has finished you can log in as normal.

But this month's most impressive tip involves file navigation. To use it you'll need the desktop update: ie, either Windows 95 with IE4 or Windows 98.

Drag the My Computer icon on to the Taskbar at the end nearest the system tray. Right-click on the handle and make sure 'Show title' is checked. Grab hold of its handle and drag it towards the system tray until just the words 'My Computer' (or whatever you may have renamed it) are visible. Now click on the double arrow for a cascading menu of the entire file system. It doesn't show hidden files or any file details, but provides a quick way to get at any other file or folder and impresses the hell out of visitors.



Catching ghosts

With the ever-increasing amount of free or trial software available on magazine CD-ROMs or the Internet, many users may have a number of 'ghost' items in Control Panel, Add/Remove Programs. The programs themselves may have been removed, but they are still listed here, and trying to remove them just results in error messages.

This can happen if the

Exorcising ghost applications with TweakUI

corresponding to the installed programs. Some will have names that relate to known applications, others may be less obvious (or even complete gobbledegook).

To find out what's what, click on the key (the folder-like thing in the left-hand pane) and examine the contents on the right. If there is a string entitled DisplayName then its value will correspond to an entry in the Add/Remove list. There should also be an entry entitled UninstallString, and its value corresponds to the command needed to

uninstall the product - it may be worth looking down any paths that are mentioned in here, if you are in doubt.

Other entries may lack a DisplayName. This usually means that they are uninstalled 'quietly' by another method, often daisy-chained from another uninstall. If you see a QuietDisplayName or QuietUninstallString then simply close the key and walk away. If you are sure, however, that you have located a phantom Add/Remove entry, then remove the entire key for that entry.

Windows 95 and 98 versions of TweakUI have an Add/Remove tab for these ghost entries

user has deleted a program from Explorer, rather than using Add/Remove; if the uninstall information is missing or damaged; or if the original installation was not completed or just badly written. Both Windows 95 and 98 versions of TweakUI have an Add/Remove tab specifically for removing these entries. Note that this should only be used for removing leftover entries in the list - it does not uninstall programs. If you don't have TweakUI, then you need to edit the registry, and the usual backing-up disclaimer applies. Under the key: HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Uninstall you will find a set of subkeys

Debugging the code

Finally, apologies to all the readers who couldn't get February's REG file listing to restore multi-columned menus to work. A printer's devil stole the first two lines, which should have been REGEDIT4 all on its own, followed by a blank line, followed by the printed listing.

CONTACTS

Tim Nott welcomes your feedback on Windows, but cannot deal with queries concerning the PCW CD-ROM or website. You can contact him via the PCW editorial office or email: windows@pcw.co.uk



Getting to know you

Terence Green hunts for familiar Windows elements, and gets to grips with the changes.

Navigating Windows 2000 Professional for the first time is not unlike playing *Where's Waldo*. Windows 95/98 and Windows NT users alike have to deal with a multitude of new user-interface features, while trying to locate old familiar tools which have been renamed.

There are new customisation settings everywhere in Windows 2000. Some, such as dragging icons to re-arrange the Start menu, are from Windows 98. Others are brand new and tend to pop up all over the place.

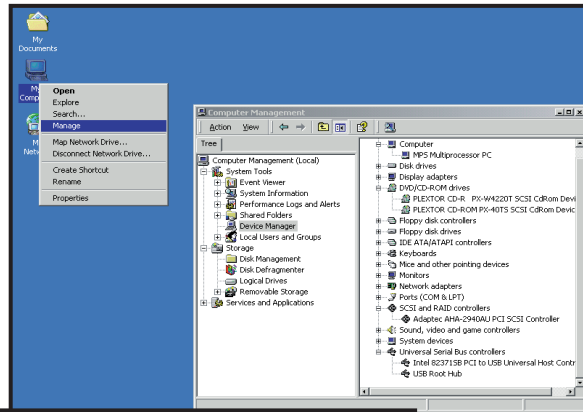
If you use the keyboard shortcuts a lot (a good move ergonomically-speaking) one of the first things you notice is they're not turned on in Windows 2000. To change this, press the Alt key to activate the shortcut underline or, to set them on permanently, right-click on the Desktop to open Display Properties, click on the Effects tab and remove the tick from the Hide Keyboard Navigation option under Visual Effects.

Personalised menus, the most controversial interface addition, don't spring to life immediately. Instead they wait and watch your movements until suddenly you notice bits missing from your Start Menu tree. What's happened

Personalised menus watch your movements until you notice bits missing from your Start Menu

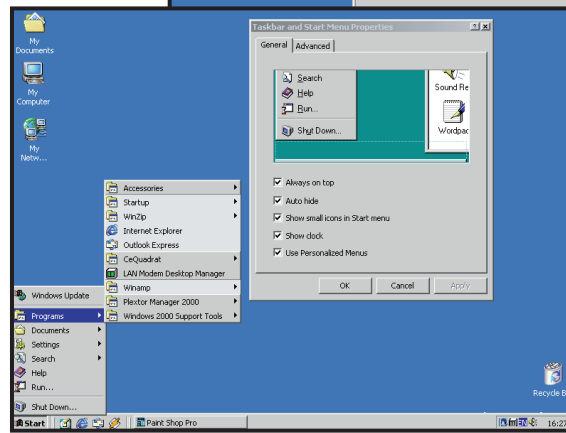
is that the least-used menu entries have been hidden - your menus have shrunk, and are now underlined by down-facing chevrons. Clicking on the chevron brings the full menu to light in an attractive striped display.

Adaptive menus are a big change, so



Manage your computer hardware and software

cosmetic and self-explanatory, but the Display Administrative Tools option might come as a relief to Windows NT users who haven't yet discovered that Administrative Tools has migrated from the Start Menu to the Administrative Tools



The personalised menu on display - it learns your habits and minimises those menus you never use

they get their own tick box on the main page of the Taskbar and Start Menu properties window. To disable shrinking menus, right-click on an unused portion of the Taskbar, select Properties and remove the tick next to Use Personalised Menus. You should consider giving the new system a whirl first, though. It takes

a while to get used to it, but you may like it once you do.

The switches for some other changes to the user interface are a few clicks further on, under the Advanced tab of Taskbar Properties. The options list under Start Menu settings is mostly

folder in Control Panel (Start, Settings). The name is about all that remains the same; the individual administrative tools are now scripts for the management shell called the Microsoft Management Console (MMC).

The MMC gives all the diagnostic and configuration tools a common user interface, whether you open the Event Viewer for a list of system messages, Services for operating system details, or even the System Information viewer on the System Tools menu. This advances Microsoft's aim to reduce the number of different places you have to visit to configure Windows 2000, but now we have a variety of views of the same data. Usefully, the one place you really need to get to for diagnosis and configuration is Computer Management, and the quick path is to right-click on My Computer and select Manage.

Computer Management collates all the Windows 2000 administrative tools. It's where Windows NT users will find the Services applet that has disappeared from the Control Panel, and where Windows 98 users can find the Device Manager for hardware configuration issues. The Services tool is used to stop, start, and configure the operating system services, while Device Manager does the same for hardware services. The Windows NT Disk Manager, with new support for disk defragmentation, has also been subsumed into Computer Management.

If you wish, you can create your own personal management console. Run

What to do in an emergency

Windows 2000 is reliable but not invulnerable. If boot files are damaged, you face complete re-install unless you can recreate the boot sectors. With Windows 98 a boot floppy, the Startup Diskette, will do, but Windows 2000 is not that easy to fix.

The likelihood of a successful recovery is markedly better if you have an Emergency Repair Diskette (ERD). It is optionally created when Windows 2000 is

installed, but should be updated after major changes such as adding a service pack or any change to the hard disk configuration. In Windows NT we used RDISK.EXE to create the ERD, but Windows 2000 has replaced this with an ERD option on the Tools menu of the Backup utility (Start, Programs, Accessories, System Tools). Windows NT users should note that ERD creation no longer backs up a copy of Registry data to the diskette. You now have to

back up the registry from a regular Backup job.

The ERD is not a bootable disk like the Windows 98 Startup Diskette, but a collection of data files that can help to restore the boot sector and startup configuration. To use it, you need to start Windows 2000 Setup, answer Yes to install, and select the R (for Repair) option. For dual-boot systems – where Windows 95/98 boots but Windows 2000 doesn't – boot Windows 98, insert the

Windows 2000 CD and select upgrade, and follow the prompts to boot into the Setup menu. Alternatively, boot from the Windows 2000 CD or make a set of four boot disks. This is no longer done with WINNT or WINNT32, but with a new utility called Makeboot. Have four diskettes ready, place the Windows 2000 CD-ROM in the drive and run the MAKEBOOT.EXE program from the BOOTDISK subdirectory.

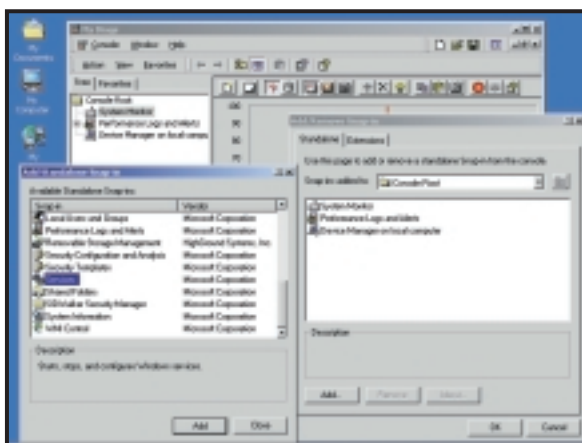
MMC.EXE (Start, Run, MMC) and select Add/Remove Snap-In from the Console menu. Click on the Add button to open the list of available snap-ins. Choose Local if any of them offer a choice between local and remote computers, and click on Finish when you're done. Use the Save As command on the Console menu to give your new

management console a descriptive name and allow it to be added to the Administrative Tools menu.

My Documents

It might seem odd that My Documents, an apparently mundane desktop shortcut that was first introduced in Windows 98, is the top dog of the few icons installed on the Windows 2000 desktop. However, My Documents is a special system object rather than a shortcut. Initially, it points to a folder in the Documents and Settings subdirectory of the Windows 2000 system drive, and is the default save location for new documents created by Windows 2000-aware applications. Older applications will have to be told about the My Documents folder, but the single location for user data files is an important part of the Windows 2000 network-management system.

Non-networked users will also



find the single folder for data useful for saving, finding and backing up data, but it needs to be treated carefully. If you maintain a separate partition

If My Documents is relocated to a PC that might be switched off, Win2K becomes unhappy

for data files, you can move My Documents from its original location to another. Right-click on My Documents, select Properties, click on Move Target, and follow the prompts, selecting Yes if you want all the files in the present location to be copied to the new location. The new location must be available at all times. If My Documents is relocated to another PC that might go into sleep mode or be switched off, then Windows 2000 will become very unhappy, in part because 'My

Using MMC you can construct your own personal management console

Documents' is the default folder for Windows Explorer.

You can change the default with Explorer startup switches, but it won't stop Windows 2000 worrying about the missing My Documents folder. To make C: the default drive to open at, locate Windows Explorer in the Accessories menu and right-click on the menu item to bring up its properties menu. Add /e, C: (leading space) to the Target so that it now reads:

```
%SystemRoot%\explorer.exe ✓  
/e, C: (Key: ✓ code string continues)
```

If all you want to do is hide the My Documents folder, you can remove it from the desktop by opening any

Explorer window, selecting Folder Options from the Tools menu, and clicking on the View tab. Scroll down the Advanced settings window until Show My Documents on the Desktop appears and uncheck it.

CONTACTS

Terence Green welcomes your feedback. Contact him via the PCW editorial office or email: win2000@pcw.co.uk



Registry reasoning

Andrew Ward sorts out **problems with hives**, common-sense printing and ghostly desktops.

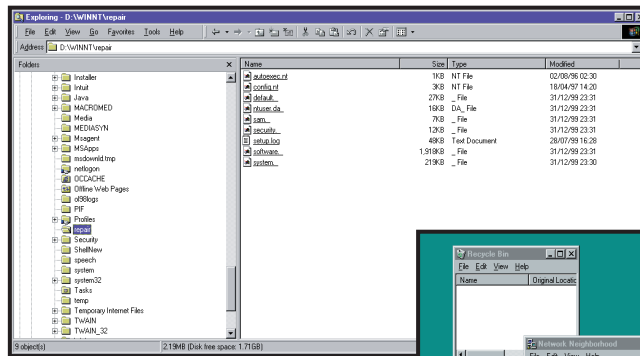
Last month I discussed ways of cramming all the files of an emergency repair disk (ERD) – whose contents are bigger than 1.44MB – onto a standard floppy. But Alan Bailey has written in to point out that reformatting a floppy disk to larger sizes such as 1.72MB with WinImage, in order to cram in all the necessary files is not the whole solution. He's quite right – I omitted to say that you can't then use the standard RDISK utility to create this disk, since the first thing it does is reformat it!

What you have to do instead is to copy the files onto your floppy disk manually. The files come from %systemroot%\repair – all you need to do is make a copy of all the files in that directory. If you still have a space problem, you can delete some of the entries in the setup.log file. Locate the [Files.WinNt] section, and delete any of the lines within it that don't belong with %systemroot%\SYSTEM32\.

If the files still won't fit on a single disk, no matter how large it is, just copy them onto more than one disk. However, you will also need to copy setup.log onto each disk. Without the presence of setup.log, the startup disks won't recognise the floppy as an ERD.

When you come to effect an emergency recovery of the registry, you recover from each disk in turn, and for each disk only check the hives that are present on that disk.

From a personal point of view, however, I've never found the ERD recovery procedure for restoring registry hives to be satisfactory. Recovery attempts have always resulted in the error message saying that the registry couldn't be repaired. The other recovery methods I've described in this column in the past are usually much more reliable, such as backing these files up onto another medium, and then either booting with a



Above: If you use a larger-than-normal disk format, you need to copy these files manually; **Right:** Even though NoDesktop Explorer hides items from view, it's still possible to open their windows

spare copy of NT, or carrying out a fresh install, and then recovering the files.

Printing locally

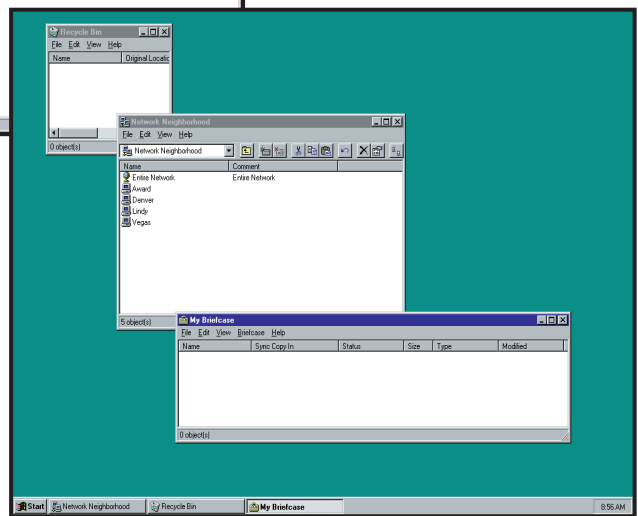
Stephen O'Connell returns us to the problem that the default printer is based on the user who logs into a PC and not the PC itself. This results in printing taking place on a device that could be in a completely different building, unless the printer is changed every single time a user logs on. The solution he's opted for is based on using regedit to import the new printer setting from a .REG file. This is carried out automatically at each logon, so users always print to the most convenient physical printer.

FIG 1

Specify a printer

```
REGEDIT4
[HKEY_CURRENT_USER\
Software\Microsoft\Windows
NT\CurrentVersion\Windows]
"Device"="\\.\VEGAS\
XeroxDoc,,LPT1:"
(Key: ✓ code string continues)
```

First, you need to create a registry file for every computer in your organisation that defines the appropriate default printer for that machine. For example, make a file called DENVER.REG containing a registry key for the printer XeroxDoc



on computer VEGAS, as outlined in Fig 1.

You'll also need to set up a logon script for every user, to cause this file to be imported into the registry. The following command will accomplish what you need:

```
If exist "%LogonServer%
\NetLogon\%ComputerName%.
REG" regedit /S "%Logon
Server%\NetLogon\Computer
Name%.REG"
```

Phantom desktop

Nick Lee points out that the NoDesktop Explorer policy doesn't really provide that much security after all. At his school, this technique is used to hide desktop items such as the Network Neighborhood, and it certainly works – the icons aren't visible on the desktop. However, they are still there and – more worryingly – they are still active.

If you press Ctrl & Esc to bring up the Start menu and then press Esc again, the Start button stays selected. Pressing the Tab key twice (or three times, if you have IE4 with the Quicklaunch pad activated)

Diskeeper can help prevent disk fragmentation, which still occurs in Windows NT

will bring the focus to the desktop. By using the cursor keys, you can then move around the desktop items – pressing Enter will open whichever one is currently selected. Of course, you can't see which one is selected since they are invisible, but you can get to the Network Neighborhood and so on by trial and error.

Unfortunately, one or two of Nick's users are aware of this, and have used this back door to install Quake on various systems, and to make changes to Windows and Microsoft Office configuration settings.

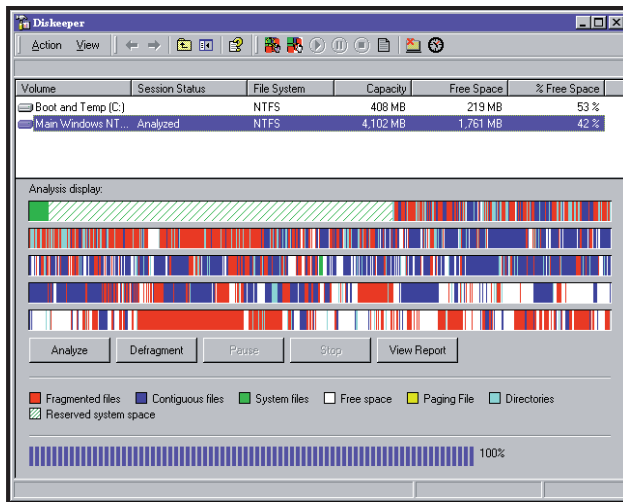
Adding RestrictRun to the list of policies in force may help a bit, but as I've said before, that isn't watertight either. Neither is NoDrives. So while using all these policies do result in a system that is a fiddle to crack, it's still by no means fully secure.

To be fair to Microsoft, the official explanation of the registry key doesn't include anything about disabling the desktop items – only that they are hidden: 'Hides all desktop items regardless of menus, folders, and shortcuts defined either by profiles or by other pointers in the policy file for custom program folders, custom desktop icons, and so on.'

Disk defragmentation

Alex Taperek is concerned about his disks becoming fragmented, and he's every right to be worried. In theory, NTFS is self-healing, and shouldn't need defragmentation. In practice, this isn't so, and a badly fragmented disk will not only slow things down considerably but could cause a system to fail altogether in extreme circumstances. Even Microsoft concedes that defragmentation is necessary, and ships Diskeeper Lite with Windows 2000.

There are several disk defragmenters available for Windows NT4, and I've covered them all before in this column at



some point in the dim and distant past. They all have their pros and cons, and they all have their ardent supporters. Diskeeper, from Executive Software, does have the prestige of being the first-ever utility (and only about the third piece of software altogether) to have achieved Windows 2000 logo certification. This is the product I use at the moment.

Another advantage of Diskeeper is that you can download a trial version for free from www.execsoft.co.uk.

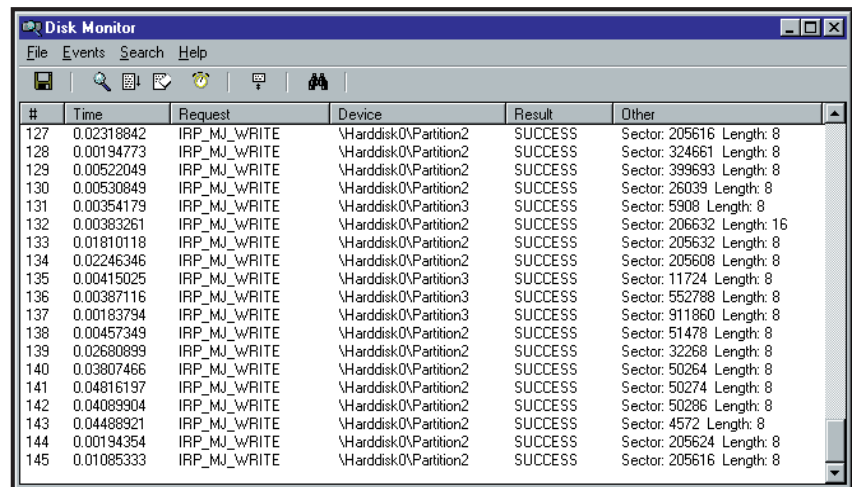
Active disks

Stuart Taylor wrote in to complain that his hard-disk light illuminated at frequent and regular intervals. Worried about any unnecessary disk thrashing, he downloaded the utilities Filemon and Diskmon to find out what was causing the accessing. It turned out that it was the Background Status Monitor utility for an Epson Stylus Colour printer. Turning this off returned hard-disk activity to more normal levels. Thanks for the tip, Stuart!

Diskmon and Filemon are both available for download at:

<http://sysinternals.ovb.ch>.

While on the subject of hard disks, various Windows NT mailing lists and newsletters carried a warning before the new year, that servers shouldn't be shut down over the holiday – in order to avoid any millennium bug or virus problems – and then restarted when people went



Diskmon can find out what's causing unnecessary accesses to the hard disk

In its latest incarnation, version 5, Diskeeper can defragment both the MFT (Master File Table) and the paging file, in addition to ordinary disk files. These system files are only defragmented at system boot time, obviously, and not while the system is running. However, in addition, Diskeeper can operate at run-time to help prevent these files becoming fragmented in the first place. Interestingly, there is no executable file or user interface for Diskeeper. Instead, it is controlled through the Microsoft Management Console.

back to work. If they were, the hard drives might fail.

The theory is that the heads on a hard drive build up a thin film of rubbish as they fly over the disk surface. This doesn't affect normal operation, but when the disk stops and the heads touch down (in normal operation, they aren't in contact with the disk itself, but literally float above it, with a tiny gap), the gunk that has built up can actually glue the heads to the drive. When you come in to restart the drives, they won't work.

These warnings initiated a flurry of



claim and counterclaim, but experienced Windows NT network managers confirmed that there is a great deal of truth in this story. For example, one administrator who'd had to shut down all his servers in order to move them to another site, said quite a few hard drives failed to restart.

There is a way to avoid this problem. It involves shutting systems down for a very short interval – maybe 30 seconds – and then starting them up again. The idea is that this is long enough to clean some of the dirt off, but not long enough for the heads to stick down fatally.

When you shut a drive down, the heads are parked on an area of the disk known as the landing zone, which is supposed to be roughened and hence will clean off some of the dirt. After following this procedure, you can then

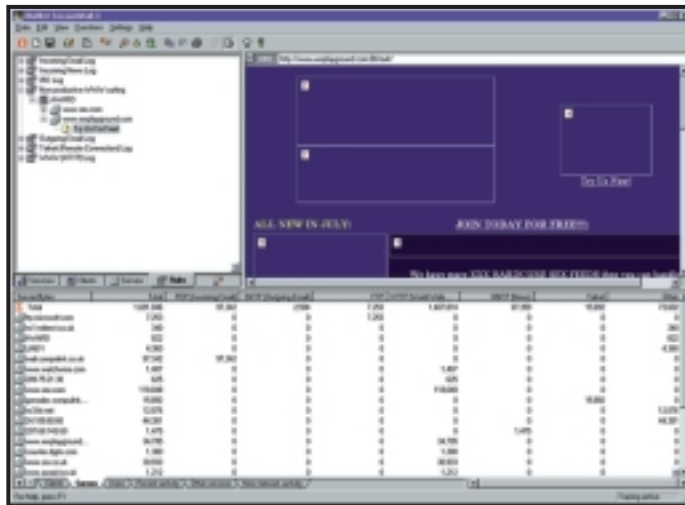
You can use SessionWall to block access to porn sites or stop people playing Quake

turn the system off again for a longer interval, with a greater chance of the hard drive restarting.

Network traffic

Russell Howe would like to be able to monitor traffic on a network for data that is destined for port 139. He wants to be able to monitor the network using any machine on it – logging the source IP, to find out who keeps using WinNuke on the school network!

There's network monitoring software included with Windows NT4 Server, but it will only allow you to monitor traffic to and from that server, for security reasons. Full network-monitoring software is included with things such as Microsoft Systems Management Server (SMS) and with Network Associates' Total Network Solution, but these are expensive. SessionWall 3 is by far the best and easiest-to-use software that I've seen, but it's not cheap either. However, you



can download a trial version to test it out before you buy.

SessionWall 3 can be used by a network administrator to monitor network traffic and track down particular problems such as Russell's, but it has other uses too. It can actually limit or disable certain types of network traffic altogether – at particular times, from specific machines, or to specific Internet hosts – so can be used to implement all sorts of Internet access policies. You can

use it to block access to porn websites, to stop people from playing Quake or to scan incoming mail for viruses. It can also help monitor intrusion-detection attempts on your network.

A trial version of SessionWall 3 is available for download from: www.sessionwall.com.

Shell extensions

Alex Taperek has also asked about the EnforceShellExtensionSecurity policy. This is to restrict those shell extensions (extensions to Windows NT Explorer) that are allowed to run. Many applications today, such as WinZip and ArcServe, install their own extensions to Explorer functionality. With EnforceShellExtensionSecurity, you can control which of these (if any) are allowed to run.

According to Microsoft, if the EnforceShellExtensionSecurity policy is turned on, the shell will only run shell

SessionWall 3 can be used both to monitor and control traffic on a network

extensions that are registered under the Approved key. However, if the same EnforceShellExtensionSecurity policy is turned off, any shell extension can be run, whether or not it is registered under the Approved key.

The relevant registry key is: [HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Policies\Explorer].

In order to enable shell extension security, add the value: EnforceShellExtensionSecurity and set it to one. The CLSIDs of any shell extensions that you want to allow then need to be explicitly added to the following key: [HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\Shell Extensions\Approved].

Home again

Finally, a quick comment on home directories – which also comes from the prolific Mr Taperek. If your client systems are running Windows 98, then setting a default home directory for users to store their data in should be straightforward.

First, create a data folder within the home directory on the Windows NT server, and then share it, giving full or change permissions to the user. Next, change the properties of the My Documents folder on the Windows 98 desktop to point to that directory (using the UNC path \\Server\Share\Folder). Normally, the My Documents folder points to C:\My Documents or C:\Windows\Profiles\username\My Documents.

When this is done, the many newer 32bit applications that default to storing documents in the My Documents folder will automatically use the data folder on the server that you have created.

CONTACTS

Andrew Ward welcomes your comments on the Windows NT column. Contact him via the PCW editorial office or email nt@pcw.co.uk



Printing from Unix

Chris Bidmead masters **setting up multiple printers** and takes a detailed look at an old master.

Last month I mentioned an email from Laurence Crummay (crums@greengates.karoo.co.uk), who wanted to know about setting up a printer on a Unix machine and sharing it with a Windows machine using Samba. I suggested O'Reilly's excellent *Using Samba*, which is also accessible online at www.ora.com/catalog/samba/chapter/book.

In fact, many of you are asking how to set up printers under Unix, and I realise I've rather neglected this side of things. Getting the printer to work under Samba, once it's operating properly on the Unix system, is the easy part of the job, as we'll see. Laurence already had one working printer hooked into the parallel port of his Red Hat 5.2 Linux server, and wanted to know how to go about adding an extra enhanced parallel port (EPP) card and attaching a second printer to it.

The advice I gave him was: 'This should turn out to be a fairly trivial exercise. The physical port that the new EPP card assigns is a low-level, PC (ie, non-Unix) interrupts/io_address issue, but I guess it will turn out to be one of `|/dev/lp0|`, `|/dev/lp1|` or `|/dev/lp2|`. If your existing parallel port device presents itself to Unix as `|/dev/lp1|`, then its I/O

Berkeley System Distribution Line Printer (BSD lp), and I'll stick with that one for now as it's the one you're most likely to come across. There are several core elements to this (executables, config files, devices) and some optional fancy front ends, but the system boils down to the following areas.

A print spool directory

This is an out-of-the-way location (usually under somewhere such as `/var/spool/lpd`) where the system will chuck stuff that needs to get printed. Effectively this directory is the printer, if the rest of the print system is working properly. There can be several print spool directories, each behaving like a logical printer. Several logical printers can be attached to the same physical printer if you want to use its different characteristics. For example, the Lexmark Optacolor 45 I'm running here also doubles as a mono printer, and I've given it a separate print spool for each of these two functions. This would be an easy way to print a colour file in black and white. Perhaps a more appropriate use for multiple queues into the same device would be with one of those multi-purpose machines that can either print documents on the spot, or send them out as faxes.

command for showing the running processes; the `ax` switch (which does vary from one Unix to another) gives you a list of all the processes in the system; and piping the output through `grep` via the `'|'` character filters this list down to lines containing the string `'lpd'`.

By the way, a stupid mistake you can make here – and I know, because I've done it – is to assume `lpd` is running simply because you get a result from the above pipeline. You might, for example, currently be checking the man page for `lpd` from another window or terminal, in which case the output line `man lpd` will be passed through `grep`. And obviously (well, it's obvious now, but this is the one that fooled me) the `grep lpd` process itself will show up in its own output.

The `/etc/` printcap file

Printcap stands for 'printer capability' and is a textfile database telling you which printers are available, how they can be used, and what print spool directories they are associated with. Seasoned Unixen write these by hand, but utilities such as Red Hat's `printtool` can construct a working `/etc/printcap` file for you as you respond to its dialog boxes. It also automatically creates the relevant spool directories for each printer in `/etc/printcap`.

If you do use `printtool`, I urge you to take a look at the resulting `/etc/printcap` so that you at least get some idea of what's going on. Your system should provide a `printcap` man page to explain how it works.

The most important print tool is `lpr`, which is how an ordinary user passes information

address will be `0x378`, and I'd expect the new port to be `|/dev/lp2|` at `0x278`.'

As Laurence already had a working printer, I suggested he take a look at `/etc/printcap`, which is the config file defining the Unix printer setup. It's important to point out that `/etc/printcap` doesn't define the physical port – it simply tells the printer daemon – `lpd` – where it is and what to do with it.

Well, if you're new to this perhaps I should start at the beginning. Several printing systems are available for Unix, but the traditional standard is the

`lpd`

This is an ever-vigilant daemon that handles stuff turning up in the print spool directories. The daemon is usually started at boot time, and is supposed to run constantly. The BSD `lpd` has a reputation for mysteriously vanishing from time to time, so if your system's ability to print suddenly evaporates, the first thing to do is to check that the `lpd` process is running. You can do this from the command line using a term such as:

```
ps ax | grep lpd
```

I'll break this down for you: `ps` is the

Print tools and utilities

These are used for checking and controlling the print system. The most important is `lpr`, which is how the ordinary user passes material into the root-privileged print spool directory, using a command such as `lpr -P lp2 printable.stuff`.

Here 'printable.stuff' is a file to be printed, and the parameter to the `-P` switch directs `lpr` to send it to the printer called `lp2`. You can omit this switch, in which case the output gets directed to the default printer, which is either the one



you've set up in /etc/printcap as just plain lp, or another printcap device whose name you've stuffed into the PRINTER environmental variable with a command such as:

```
export PRINTER=lp3
```

This PRINTER variable is then checked by lpr, which collects up other information from the command line, creating a control file that also gets sent to the print spool. Lastly, lpr sends a message to the lpd daemon to say that the print spool is ready to be serviced.

Even if you're not using lpr directly (printing from GIMP, for example), this utility and the rest of the printing subsystem are still being evoked behind the scenes. Therefore, it's as well to know how to check from the command line that they're all working.

There are some other print utilities included in the BSD lp distribution. Line printer control program (lpc) is a general tool that can check the status of the lpd and the print queues, as well as turning printing on and off. To remove jobs from print queues, there's the lprm utility. lpq is a print queue inspector, useful for investigating what's going on if nothing is actually coming out of the printer.

Laurence got back to me to tell me of a successful result with his new Epson printer: 'Many thanks for your help. I edited /etc/printcap as follows:

```
:epson:\
:sd=/var/spool/lpd/epson:\
:mx#0:\
:sh:\
:lp=/dev/lp2:\
:if=/var/spool/lpd/✓
olivetti/filter:
```

(Key: ✓ code string continues)

I then created the various directories in /var/spool/lpd, and hey presto! It works great now.

'As you suggested, my existing parallel port was /dev/lp1 – and the new one is /dev/lp2. The I/O addresses you suggested were also correct. As for the Samba side of things, it just happened! I think the entries in /etc/printcap become the printer shares for Samba [yes, they do]. They appeared in Network Neighborhood and setup fine.'

The low-down on USB

Peter Gray (peterg@paston.co.uk) writes: 'I have been reading all the articles on Unix (Linux) that I can find, but so far I haven't found any reference to support for USB. My current machine (that I

assembled myself) uses USB for mouse, keyboard and monitor, and I would like to add Linux to it, but not at the cost of having to reconfigure it every time I change OS.'

Peter, USB support in Linux is still in its early stages. But you should be able to find the information that you need at www.linux-usb.org. Please get back to me and let me know how you get on.

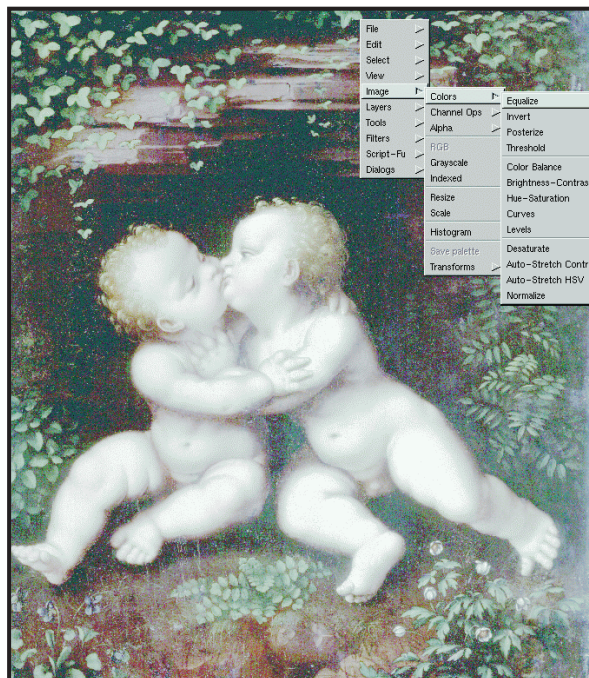
Bring out GIMP

A familiar cry for help comes from Roger King (kingfamily@clara.co.uk), who writes: 'Hi Chris. After the fourth attempt I have got Linux and Xwindows working. Finally, now that I've got it installed, WHAT DO I DO WITH IT?'

It's a question I understand, as it doesn't seem so long ago that I was in the same position. These days I use Unix for everything I do on computers, but that probably doesn't help answer the question. So here's a (very) specific case study. My mate Marcus owns an old painting attributed to The School Of Leonardo. It's worth a few bob as it stands, but would go up into telephone numbers if, as Marcus believes, Mr Da Vinci himself actually had a hand in painting it. So he's put together a website (at www.lostleonardo.com) that gathers together scholarly opinions about the painting and its period.

He's got a picture of the painting up there too, of course. But there was a fashion a few hundred years ago for coating old masters in dark varnish, and the detail isn't very clear. What Marcus needed was a sort of X-ray. He had a huge, 75MB scanned TIFF of the picture – was there some way that we could bring out the detail using a computer?

At this point we needed to bring out the GIMP. This is a sensational piece of free software you can download from www.gimp.org – the name stands for the GNU Image Manipulation Program. Loading this enormous file into the GIMP was tediously slow – but the problem



The Gimp loads the original old master – all 75MB of it!

wasn't Linux, but the relatively modest 200MHz Pentium Pro and 64MB of RAM it was running in. It would have been nice to try this on the speedy dual-processor Fujitsu-Siemens Celsius workstation I had here last year, but alas that's had to go back to the manufacturer.

However, I realised that it wasn't necessary to work on a file this size, because it had a much higher resolution than anyone would be able to see in a browser (Marcus used high resolution to show individual sections of the picture on the website). So I used Gimp to create a reduced version less than 1MB in size.

The first thing we did, now that we had a manageable file, was equalise the colours (Image/Colors/Equalise from the right mouse button menu). This gave us our X-ray – a false colour rendition that brought up all the detail we were missing.

Next month, I'll tell you how we used the GIMP's multi-layer feature to create a version that brings out most of the detail – without departing too much from what were probably the original colours.

CONTACTS

Chris Bidmead welcomes your comments on the Unix column. Contact him via the PCW editorial office or email: unix@pcw.co.uk



Sound advice

Gordon Laing finds that, oddly, your sound card could be to blame for **slow frame rates** in games.

This month I've looked at 3D surround sound for games, particularly in terms of the four-channel EAX and A3D solutions from Creative Labs and Aureal respectively – and wouldn't you know it, a whole load of performance issues emerged. Believe it or not, your innocent sound card makes a significant

effect further still. The quality and delay of the reflected sound reveals a great deal about the surrounding environment and its size.

Most humans can perceive precisely where first-order reflections are coming from, and some can distinguish second-order reflections too. However, as more and more reflections arrive at the ear, the brain tends to combine them into one

This is obviously no good for games, where the sound needs to interactively change with the on-screen action in real time. What now seems like a very long time ago, Creative Labs (www.soundblaster.com) came up with its SoundBlaster mono audio standard for DOS games on PCs. As the standard matured, realism improved with stereo capabilities (SB Pro), and quality leapt forward with CD resolution (SB 16). When you started your game, you'd select the audio option that matched your sound card.

Microsoft, however, changed the entire multimedia standards game with its DirectX standard in Windows 95. The idea was that DirectX offered a load of commands, also known as APIs, which did things like 'make a sound on the left' or 'draw a sphere in front'. Games would then simply make DirectX calls and the hardware manufacturers would have to ensure their sound and graphics card drivers understood them.

The audio portion of DirectX 1 and 2 was called DirectSound, and this offered basic stereo left and right panning effects. DirectX 3 introduced DirectSound3D (DS3D) which offered a range of commands to place a sound anywhere in 3D space. This was known

Using reverb properly is the first key to simulating different environments

contribution to the total frames per second you end up getting on screen.

Surround theory

The human brain is a very cunning processor, which in terms of audio can pretty much determine the location and condition of a sound given just two ears and the ability to turn using our head and body.

The sound source could be a car engine, a mouth, a musical instrument, slamming door, or even a glass breaking as it hits the floor. The source itself radiates the sound in a variety of ways – most of the sound out of a person's mouth comes from where their face is pointing, whereas an engine radiates sound in pretty much all directions (see diagram).

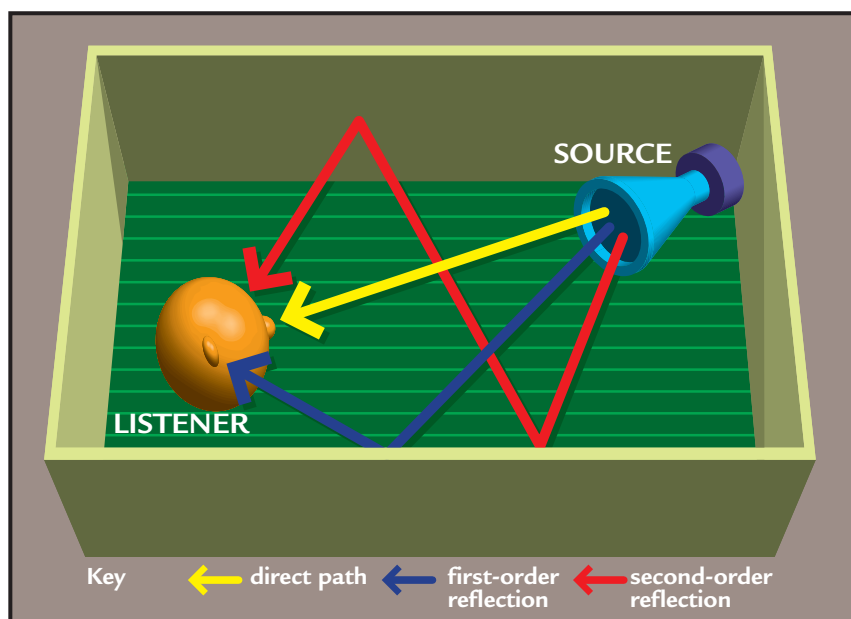
Once the sound is radiated, the environment comes into play. The actual medium between source and listener greatly affects the sound, as anyone knows who has shouted on a windy day, or heard something underwater. The first part of the sound we hear has travelled directly from the source in a straight line.

However, some of the sound could reach our ears after bouncing off a wall or object, and the material of these obstacles absorbs certain frequencies, along with reducing the overall volume. This 'first-order reflection' arrives not only sounding different from the direct source, but also slightly after it. Second-order reflections and so on take this

late-order reflection echoing effect known as reverb. Using reverb properly is the first key to simulating different environments.

Sound standards

Surround sound for the movies is pre-recorded and delivered consistently to the ear, no matter what cinema or home it is replayed in. Just about the only thing Dolby cares about is how far away the rear speakers are from the front and from the listener. Beyond that it's the same linear delivery, without any interaction from the listener – the same as listening to music.





as positional audio, and required significant processing power. Sadly we had to wait for DirectX 5 before Microsoft allowed DS3D to be accelerated by third-party hardware, reducing the stress on the main system CPU.

Beyond DS3D

DS3D may have supported positional audio, but it didn't offer much support for adding reverb, let alone considering individual reflections, to simulate

A3D 2 genuinely calculates up to 60 first-order reflections, which interact in real time

different environments. Re-enter Creative Labs with its Environmental Audio Extensions (EAX) and Aureal (www.a3d.com) with its A3D systems.

Aureal developed A3D initially with NASA for flight simulators, and it's indeed the technically superior standard. The current version, A3D 2, actually takes the geometry information of the room that is fed to the graphics card, and uses it to render realistic sonic reflections and occlusions (where an object gets in the way). Using a technology called WaveTracing, A3D 2 genuinely calculates up to 60 first-order reflections, which interact in real time with the environment, and then groups later-order reflections into overall reverb. The A3D API is entirely independent from DS3D and works by itself to create positional effects and reverb.

Creative Labs took the computationally easier approach with EAX, by gathering together all reflections and creating predefined reverb effects. These simply simulate certain rooms, such as an aircraft hangar, carpeted hallway or stony cave. Creative then submitted this list of predefined reverb effects as an open set of extensions to Microsoft's DS3D - they are, quite literally, environmental audio extensions. In games which use DirectSound and EAX, DS3D provides the positional effects, while most programmers simply apply a single EAX preset reverb setting until the player moves into a new room. To be fair, EAX has just recently been updated to version 2, which also includes support for occlusions, however, it is still nowhere near as thorough as A3D 2.

Hardware support

As A3D 2 is such a computationally-complex system, Aureal developed a processor dedicated to the number crunching - called the Vortex2. It's available on sound cards such as VideoLogic's SonicVortex2 for around £50 (www.videologic.co.uk). Soon-to-be-released drivers for the Vortex2 are also expected to support hardware acceleration of DS3D and EAX for wider games compatibility.

EAX is most widely offered on Creative Labs' SoundBlaster Live cards, which also start at around £50 - in fact, in terms of gaming, all Live cards are essentially the same, with the different packages offering a variety of hardware and software bundles aimed at recording musicians. While any Aureal Vortex2 card will record 16bit audio and talk to MIDI instruments, packages such as

drivers are free downloads, and there's probably sufficient processing power for an additional upgrade later this year too. However, there's not sufficient muscle for this DSP to effectively process A3D 2 commands.

Aureal has also recently announced A3D 3, which should turn up later in 2000 with new sound cards featuring an enhanced Vortex2 chip, along with a DSP to accelerate the new commands. A3D 3 also has some interesting support for Dolby Digital and streaming which we'll cover in future hardware columns when more information is available.

Games support

Modern PC games support EAX, A3D, or sometimes both sound standards. Quake III Arena, along with demanding OpenGL for graphics, only supports positional audio via A3D 2. With Creative's backing, however, there are already more games supporting EAX 1 than A3D 2.

Unreal Tournament is fairly unusual in that it supports positional and environmental audio from both DS3D (with EAX) and A3D 2, so is the perfect testbed to compare sound systems. I ran



Unreal Tournament - a great showcase of A3D 2's stunning positional audio capabilities

Creative's £180 SB Live Platinum wipe the floor with them in terms of semi-pro recording facilities.

Rather than create a dedicated chip for EAX as Aureal has for A3D 2, Creative Labs' Live cards employ an EMU 10K1 DSP (Digital Signal Processor). Creative's LiveWare program actually loads the appropriate EAX software into the DSP, which allows a certain amount of upgrading. Some Live cards are over a year old, but the latest LiveWare 3 drivers will give any of them support for the latest EAX 2 commands - the basic

separate tests using a VideoLogic SonicVortex2 and Creative Labs SoundBlaster Live Platinum. The test system was a PIII 550 with 128MB of RAM and, ahem, an ageing Matrox Marvel G200 graphics card. I used four-channel output, connected to the power amps and speakers of my home cinema surround-sound system as described in the boxout overleaf.

Quality

First things first: playing games in four channels with either EAX or A3D is a

Four-channel speaker systems

While DS3D/EAX and A3D will happily simulate 3D sound using only two speakers, the best effects are when four speakers are used. Both SoundBlaster Live and Vortex2-based sound cards feature a pair of analog stereo outputs, one for the front speakers, the other for the rear.

If you've got an existing surround-sound system for movies, you may well be wondering whether you could use the same four-corner speakers for your PC games. Unfortunately, most PC speaker packages are

designed for one or the other. DVD movie packages take the raw compressed Dolby Digital bitstream from the digital SPDIF output and decode it, before sending it to the appropriate amps and speakers. The best gamers can hope for is a plain analog stereo connection from their sound card, and non-interactive Dolby ProLogic processing.

Unfortunately, it would take too much processing power to realtime encode the analog four-channel EAX/A3D output into Dolby Digital, to feed games to a

movie speaker package. Equally annoying are four-channel analog gaming packages which won't decode Dolby Digital.

Creative Labs' DeskTop Theatre 2500 package, however, offers the best of both worlds with SPDIF input and decoding for Dolby Digital movie soundtracks, but also analog pass-through inputs for directly addressing the four corner speakers. Hopefully, more speaker manufacturers will take this approach.

My own movie surround system consists of a Dolby

Digital processor with separate power amps for the speakers. I connected the front two sound card channels to my processor's analog input and set the mode to plain stereo.

For the rear channels, I had to insert a passive QED switching box between my processor and power amp, to allow my sound card to access my surround speakers. I'd prefer not to have used a switching box, but at least the front channels are uncompromised, and the resulting sound for games is superb.



These are the logos to look out for to find games that use EAX and A3D technology (from Creative Labs, left, and Aureal, below left)

remarkable and highly recommended experience, but which sounds better? I've read plenty of editorial reckoning A3D 2 is superior in quality to EAX 1, but only slightly. I'd say it's more like the difference between night and day. Certainly EAX significantly improves the basic DS3D experience with nice reverb effects, but switching to A3D 2 is stunningly different. In Unreal Tournament and Quake III Arena, A3D 2 positions sounds so precise that you can hear someone running around a room, and then turn to just the right point to face them – it's an unbelievably realistic experience that greatly enhances the game. Even Creative's latest EAX 2 demos fall way short of those for A3D 2 supplied with oldish Vortex2 cards.

Performance

Now for the big but. The Vortex2 processor may accelerate A3D 2, but it still places a big hit on your main CPU. Using the timedemo stats in Unreal to show a framecount, I measured approximately 55fps for basic stereo DirectSound, 45fps for DS3D with EAX

and 35fps for A3D 2 – that's quite a significant hit and Aureal is understandably concerned.

The 3DSoundSurge website (<http://3dsoundsurge.com>) measured better performance of recent A3D drivers from Aureal, and I can certainly confirm that Vortex2 owners should immediately download the latest set with v2.25 of the A3DAPL.DLL. Games programmers can also make a big difference by optimising support for A3D 2. The 3DSoundSurge website found that Heretic II most effectively implements A3D 2, and with the latest A3DAPL.DLL measured a performance hit of only one per cent between A3D 2 compared to plain DirectSound; using earlier DLLs, there was as much as 25 per cent difference.

Sadly there are other issues with Vortex2 sound cards. Unlike the Live cards, there's currently no SMP support for dual-processor machines. Aureal says it will support SMP with a new WDM driver for Windows 2000 available



around the time of the new OS' launch, but hasn't confirmed one for NT. There are also rumours concerning incompatibilities with some motherboards and Athlon processors, so check your manufacturer's website for patches or warnings before committing to A3D.

I would say, however, that A3D 2 is

worth it. Having tried both systems, I'd sooner suffer the performance hit and enjoy the sheer sonic superiority of A3D 2. After all, my frame rate can be significantly improved by upgrading my Marvel G200. Sadly, no amount of hardware can make me a better player, so I'm just off for a bit more practice – the name's Zardo if you fancy an easy frag on a Quake or Unreal server!

CONTACTS

Gordon Laing welcomes your comments on the Hardware column. Contact him via the PCW editorial office or email:

hardware@pcw.co.uk

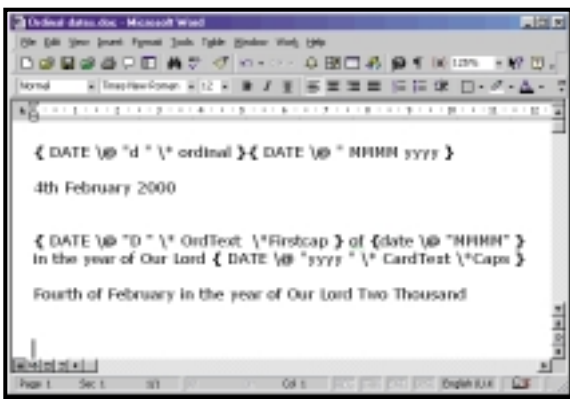


Cardinal rule for ordinals

Tim Nott reveals how you can get those tricky **ordinal dates** into a word-processing document.

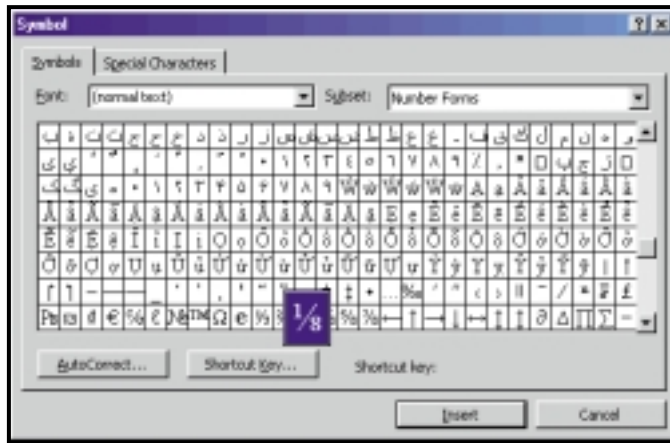
A frequently-asked question among Word users is how to get an ordinal date into a document other than by typing it. Although the Insert, Date and Time command offers a variety of formats, ordinal dates (eg 3rd April) are not among them. Those who roll their own date fields with the appropriate date picture switch will also be disappointed, as ordinals don't figure in the options there, either. However, with a little ingenuity, it can be done.

First you need to split the field into two – one for the day of the month, and one for the month and year. You'll then be able to format the number returned by the solitary 'd' in the date picture as an ordinal, using the *ordinal switch shown in the screenshot below. The second field just includes the month and year in its date picture. You can use this technique with other date functions, such as CreateDate, and carry out the usual date manipulations.



Field codes for ordinal dates, as well as their results

There may be occasions, for instance in legal documents, when you want to spell out an ordinal (or cardinal) number, such as 'sixteenth' or 'two thousand'. In this case, use the *OrdText or *CardText switches instead. For the finishing touch, these



switches can be followed by the *FirstCap, *Caps and *Upper switches, which offer varieties on capitalisation. Finally, if you think that all this field work is more effort than typing in the date manually, then you have a point. But bear in mind that once the fields have been created, they can be re-used either in a template or as an autotext entry. One slight snag with this is that if you are using the AutoFormat-as-you-type option to set ordinals in superscript, this doesn't work on the fields. Curiously, if you AutoFormat a selection containing such a field, it does.

Personally, I think superscripted ordinals look rather fussy, so I disabled this feature.

On a related AutoFormatting note, I do like having, for example, 1/4 changed to a proper typeset fraction. However, although all the standard Windows fonts, and most of the MS Office fonts contain eighth fractions (some also contain thirds),

these don't jump into action like the half and quarter. Remedying this, in Word 97 onward, is simplicity itself. From the Insert, Symbol dialog, find the relevant fractions (they lurk in Normal Text, Number Forms), then highlight each in turn and hit the AutoCorrect button.

Adding the missing fractions to AutoCorrect

This takes you straight to the AutoCorrect dialog, with the proper fraction in place – all you need to do is type the appropriate number-slash-number to be replaced.

Switch glitch

Further to February's tip on opening Word and automatically loading the most recent document

worked on, Peter Lloyd has an even easier method. Adding /mfile1 as a command-line switch when starting Word automatically opens the last document without needing a macro.

Thanks also to Bob Monroe, who points out that I was wrong about another switch – the /n switch does not stop Autoexec macros from running. More egg on face. Several readers wrote in to say there is an easier way of automatically inserting the current date into a letter, and protecting it from subsequent changes (January, p241). If the template contains a CreateDate field, then this will return the date that each new document based on that template is created. For several years I had been under the illusion that this returned the template's own creation date.

Finally, a quick tip. Whether you like Word 2000's single-document interface or not, it's a big improvement having the document names listed on the Taskbar. If, however, you like to keep your hands on the keyboard, Control & F6 switches through open documents in all versions of Word – add Shift to reverse the order.

CONTACTS

Tim Nott welcomes your feedback and suggestions on word processing topics. You can contact him via the PCW editorial office or email: wp@pcw.co.uk. Please do not send unsolicited file attachments.

Gaining your interest

Stephen Wells programmes his spreadsheets to find out if it's worth **paying the bills** on time.

Since the Late Payment of Commercial Debts (Interest) Act was introduced, many companies billing other firms have legally added interest to any invoices that have remained unpaid after 30 days. This is one way to deter large companies from squeezing free credit out of smaller ones. Perhaps a more psychologically-attractive method to get the money in is to offer a discount for early payment. It is this approach that has prompted several readers to ask variations of the question: 'As the cost of borrowing has fallen lately, is it worth taking advantage of a two per cent discount if I pay within 20 days, when I normally wait until invoices are 60 days old?'

To understand the answer you have to realise that, if you normally pay this supplier after 60 days, you are in effect borrowing the money at an interest rate that is the annual equivalent of the company's discount. So you need to

	A	B	C	D	E
1	A	Discount offered by supplier:	2.00	%	
2	B	100 minus the discount offered:	98.00		
3	C	A divided by B	0.020408		
4	D	Normal Payment Period (days):	60		
5	E	Qualifying Payment Period (days):	20		
6	F	D minus E	40		
7	G	365 divided by F	9.125		
8	H	G multiplied by C times 100	18.62	%	
9					
10		Take the supplier's discount if your			
11		cost of funds is less than -	18.62	%	
12					

Screenshot 1: How to calculate the comparable value of an offered discount

(0.020408). In C4 enter your normal payment-period in days (60). In C5 enter the qualifying payment period in days (20). In C6 enter C4-C5 (40). In C7 enter 365/C6 (9.125). In C8 enter C7*C3*100 (18.62). Meaning that if 18.62 per cent is

greater than your cost of funds (which it probably is at the moment) then in this instance it's well worth it to pay the invoice and take the discount.

If you would rather express all this in one formula then it's:

$((365/(NPP-QSP))*(C1/(100-C1))*100)$ when NPP is the Normal Payment Period and QSP is the Qualifying Settlement Period.

Linear interpolation

If you keep records where a value in column A has an equivalent value in column B – they might be instrument readings, for instance – it can be useful to be able to project what a logical answer in column B would be for an unlisted value in column A. Long-time contributor to the spreadsheets column, Shane Devenshire, has provided a formula to do

this. The process is termed linear interpolation – or an expected point on a line when following a trend.

Enter your values in column A (see **screenshot 2**) and what we will call 'readings' in column B. The list needs to be sorted in descending order based on column A.

To simplify the formula, part of it has been given a Name. So choose Insert, Name, Define and enter this formula in the Refers To dialog box:

`=INDIRECT("A"&MATCH(Sheet1!A1,Sheet1!A1:A6,1))`

In the Names in Workbook dialog box enter the Name, T and choose Add, then click OK. Save the workbook to register the Name.

In cell A11 you can enter the new value for which you wish to find the equivalent reading. In B11 enter:

`=IF(A6=A11,B6,TREND(OFFSET(T,0,1,2),OFFSET(T,0,0,2),A11))`

Cell B11 will then display the answer. The formula won't provide answers to entered values below the first value in the table, but it will provide them for values higher than the largest value in the table.

If you just want to increase the series, you don't need a formula. Copy the range A3:B8 to a clear part of the worksheet, then drag the fill handle (at the bottom right-hand corner of the range) down the sheet. Alternatively, copy the range to say, G3:H8 then select G3:H15 and choose Edit, Fill, Series and check the Trend box.

	A	B
1	Value	Reading
2	1	0.2
3	4	0.8
4	7	1.4
5	11	2.2
6	12	2.4
7	15	3.8
8		
9		
10		
11	12	2.4
12		
13		
14		
15		

Screenshot 2: How to calculate expected results in a linear list of equivalent values

calculate the annual cost of the discount and compare it to the cost of your overdraft – or the money you would earn from interest, if the money was in your bank account instead of the supplier's. Either way, time is money.

In any spreadsheet, enter in cell C1 (see **screenshot 1**) the percentage discount offered (in this example it is two). In C2 enter 100-C1. (Here the answer is 98). In C3 enter C1/C2

CONTACTS

Stephen Wells can be contacted via the PCW editorial office (see page 10 for address) or email spreadsheets@pcw.co.uk. Please don't send attached files until requested.



Random pleasures

In the search for **generically modified solutions**, Mark Whitehorn takes the reader's advice.

In the January column I discussed methods of returning a random selection of rows from a table. I provided two solutions, but one made use of Access-specific features, while the other didn't return an exactly pre-definable number of rows. I didn't think there was a totally generic solution using only set-based operations, but threw it open to the readers.

ID	Foo	Baa
1	afds	j
2	afg	hjd
3	fg	gj
4	fg	gfhj
5	afg	gfn
6	fda	swtr
7	h	hse
8	sth	hjs
9	th	trhte
10	th	j
11	t	rsthj
12	afg	tdgj
13	adf	rsth
14	gad	jy
15	f	srth
16	dah	s
17	dsah	ytjs
18	ah	rth
19	h	dsyj
20	ht	dsy

Screenshot 1: The base table

Thanks to all who responded. Several people came up with code solutions which were interesting but, by definition, non-generic.

Ken Sheridan agrees that a universal, set-based solution is unlikely, because the SQL standard doesn't include a pseudo-random number generator. However, he did come up with an entirely set-based solution that answers a slightly different question. This question is, how do you find a subset that consists of rows which are evenly distributed throughout the table with respect to the values in the primary key?

In other words, given a table as used in the January issue (see [screenshot 1](#)), how would you extract, say, the rows in

Screenshot 2: Ken's solution works with non-sequential primary key values

which the ID value was 10, 20, 30 and so on?

My simple answer is something like:

```
SELECT ID, foo
FROM Linda
WHERE 0 = id mod 10;
```

This uses the MOD function (which is part of the SQL standard). MOD returns the remainder of an integer division. So, for example, 7 MOD 3 returns the figure 1, while 40 MOD 10 returns zero.

This works but – and it's an important but – it only works when the primary key values are evenly distributed. Even using an autonumber field, as soon as you start deleting records, the efficiency of this solution begins to degrade (OK, it stops working).

Ken's solution is more complex, but it works with a non-sequential set of primary-key values ([screenshot 2](#)); mine doesn't ([screenshot 3](#)). It is also worth studying as an example of the flexibility that can be achieved with an intimate knowledge of SQL.

ID	foo
50757	y
110278	gj
177723	fd
217241	gh
261253	fg
301967	hrw
354543	yteu
406657	fdsg
434194	gwt
489146	ewrt
538492	fdsg
598206	fs
642953	gfd
725599	tw
799968	fdsg
844537	th
892714	rew
926326	fds
968358	utik
995034	fs

```
SELECT L1.ID, L1.foo
FROM Linda AS L1 INNER JOIN
Linda AS L2 ON L1.ID >= L2.ID
GROUP BY L1.ID, L1.foo
HAVING COUNT(*) MOD (SELECT
INT(COUNT(*) / 20) FROM
Linda) = 0;
```

(Key: ✓ code string continues)
(INT is also part of the SQL standard.)

All you want to know is, how does it work? Try dissecting it yourself, because there is fun to be had in working it out. If you get stuck (or bored) the solution is below.

We can dissect out the first part of the statement and add another field to the list to make it easier to see what is happening.

```
SELECT L1.ID,
L1.foo, L2.ID
FROM Linda3 AS L1
INNER JOIN Linda3
AS L2 ON L1.ID >=
L2.ID;
```

Screenshot 3: Mark's solution working less well

ID	Foo
259010	th
317310	t
798180	dah
257390	fdsg
159210	e
894750	e
122200	wy
459570	req
535410	rwh
816350	nwy
695560	ag
201140	qer
990330	h
916110	yuyt
972800	yy
960690	ttw
398020	dfng
845230	hwr

L1.ID	L2.ID	foo
1	1	afds
2	1	afg
2	2	afg
3	1	fg
3	2	fg
3	3	fg
4	1	fg
4	2	fg
4	3	fg
4	4	fg

This says, show me every record, joined to itself on the ID field. Oh, and also show me every record joined to every record that has a higher value in the ID field. I've modified this query to run against a version of the base table that has only four rows (and then sorted the answer table) to make this more apparent (screenshot 4).

Given 200 rows in the base table, this is going to generate a large answer table (20,100 rows in fact). However, the interesting point is that the different values of L1.ID appear a different number of times. In the L1.ID field, the value 1 appears only once (matched to itself). The value 2 appears twice, the value 3 appears three times and so on. This is why we get 20,100 rows in the answer table because it is equal to $1+2+3+4...+199+200$.

So, the first part of the SQL statement generates a table in which each 'row' from the original table is represented a different number of times. This process works quite happily if the numbers in the ID field are not a continuous set, because it relies upon their relative – rather than their absolute – position.

Now think about another part of the SQL statement:

```
SELECT Int(Count(*)/20) ✓
FROM Linda;
```

This counts the number of rows in the original table (200) and divides by 20 – returning the value 10. Remember that our intention is to extract 20 records from the original table. The value that has just been calculated (10) essentially tells us that if we take every tenth record from the original table, we will get 20 rows in all.

So, the only remaining question is, how can we extract every tenth record from the answer table? Well, rather neatly, we can group the rows in the answer table and count the number of

Screenshot 4: Part of the SQL statement

times each is represented. As already discussed, the first is represented once, the second twice, and so on. So if we count the number in each group, we get a count in each group of 1, 2, 3 and so on.

All we have to do is to divide this number by 10 (as provided by SELECT Int(Count(*)/20) FROM Linda) and use the MOD function to give us only the rows in which the answer is a whole number. This magic is performed by the bit that reads:

```
HAVING ✓
COUNT(*) MOD (SELECT ✓
INT(COUNT(*) / 20) FROM ✓
Linda) = 0;
```

Before anyone else does it, I'll point out (as Ken did) that this is a poor solution for large data sets because of the non-linear relationship inherent in the line:

```
INNER JOIN Linda AS L2 ON ✓
L1.ID >= L2.ID
```

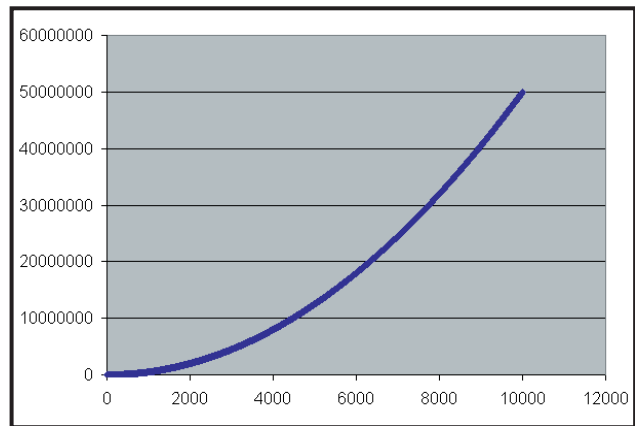
As the number of rows in the original table increases, the solution becomes increasingly slower because the number of records in the answer table grows so quickly (remember that it is based on $1+2+3...+n$ where n is the number of rows in the base table) as in screenshot 5.

Linda Ratcliffe, who originally posed the question, was delighted with the answer. However, she noted that in a single session, running the query will give a different set of 20 records each time, but the next time you open the database and run the query it repeats the same sets of records as in the previous session.

This is due to the way that computers generate random numbers. There is no easy way of getting a computer to 'choose' a number at random, they are too deterministic, so they typically use what are called pseudo-random numbers – essentially an almost-random set of numbers generated from an initial seed number; one side effect is as described. I use the term side-effect and not problem because, depending

upon the app, this can be exactly what the user wants.

When repeated random numbers aren't desirable, you could try searching the help system for the word Randomize, as this will point to an often-applied solution.



Screenshot 5: Yes, it does really mean that 1,000 rows in the original table generate 50,005,000 rows in the answer table.....

Net addresses

I asked about how to get the address of a network card for someone's database. Ian Barker sent in some code that he uses. It originally came from the VB Knowledge Base on the January 1998 MSDN CD, Article ID: Q175472. He's tied it up, added some comments and optional formatting for the ID. This worked on two of the three machines upon which I tried it (it simply returned zeros on the third). So give it a try, but you might have to do some tweaking.

The example MDB file (and the one used above) are available on the cover CD-ROM.

Teacher's pet

Any teachers reading this might like to have a look at the PDA column in this issue for an interesting program called Nstore. This mixes the reporting systems of databases and school teachers in an interesting way.

CONTACTS

Mark Whitehorn welcomes your feedback on the Databases column. Contact him via the PCW editorial office, or email: database@pcw.co.uk



Cracking the encoding

Niall Magennis gives you a step-by-step guide to encoding **MP3 files** from your CD collection.

The controversy surrounding the distribution of MP3 files on the Internet has tended to cloud the fact that the MP3 format can be used as a great way of managing the music collection that you already legally own. Encoding songs as MP3s allows you to store loads of tracks on your hard drive, yet use very little space. If you've got a CD burner, you can use the MP3 format to create a single CD that will hold up to 12 of your favourite albums. This means, for example, that you could carry a fair chunk of your CD collection to work on a single CD for playback on your computer.

However, *PCW* still gets a lot of email from readers who are having problems with CD rippers and encoders, so I've decided to do a walkthrough of MP3

encoding. I've chosen Audiograbber as an example, mainly because it has a fantastic interface and is extremely easy to use, but also because a functional demo is available for free download. On the next page you'll find a simple guide to encoding MP3 tracks.

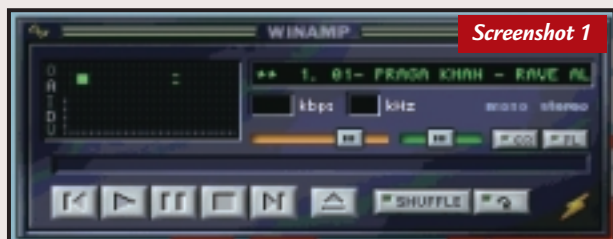
After you've tried the walk-through you may think the encoding is taking longer than it should. This has nothing to do with Audiograbber, it is a symptom of using the BladeEnc encoder. This a fine encoder and is available for a large range of operating systems, including Linux, but unfortunately it can't compete with commercial encoders in terms of speed.

If, after trying a bit of encoding with the above method, you really want to encode a lot of files with good sound quality, then your best bet is to plump for AudioCatalyst from Xing

(www.xingtech.com). This is exactly the same program as Audiograbber except it is bundled with the commercial MP3 encoder from Xing. The Xing encoder is a good example of a commercial encoder. It offers very fast encoding speed and good sound quality, with a host of other features, such as variable bit rate encoding for creating even smaller MP3 files and a choice of encoding rates ranging from 32Kbits/sec right up to 320Kbits/sec. Best of all is that it only costs around £19 if you buy it online.

Sadly, the original and perhaps the best encoder is no longer freely available. L3enc from the Fraunhofer Institute used to be available for purchase in a format that Audiograbber could use, but due to the ease with which the file could be pirated, the Institute now only sells the encoder to software developers.

Two-way traffic: Converting MP3s to .wav files



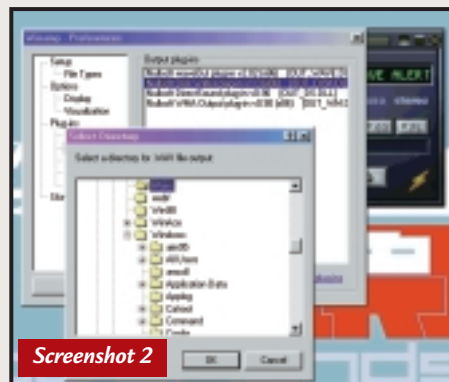
Screenshot 1

There may be times when you want to convert an MP3 file into a wave file. For example, you may want to load it into an audio-editing package to apply effects.

One of the easiest ways to do this is to use Winamp, the popular MP3 file player that can be downloaded for free from www.winamp.com. It's not immediately obvious from Winamp's interface (see [screenshot 1](#)) that it can be used as a file converter, but if you dig a little behind the scenes, you'll see it's quite easy to convert any MP3 files back into a .wav file.

Here's how:

1 Click on the button in the top-left-hand corner of Winamp's main window. This will bring up a menu.



Screenshot 2

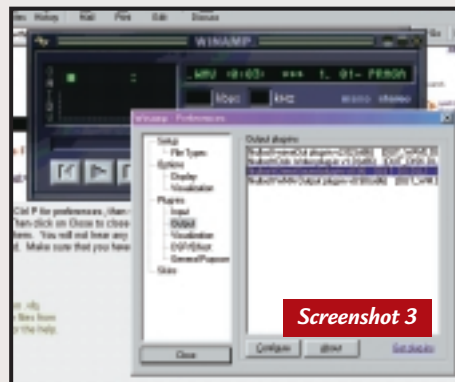
Select Options and then Preferences.

2 The Preferences menu will pop up and from here click on Output under the plugins tree. From the output plug-ins menu, select Nullsoft Disk Writer plug-in and then select Configure to navigate to where you want the .wav files to end up (see [screenshot 2](#)).

3 Now load the files you want to convert into

Winamp's playlist and hit play. The converted files will be in the folder you specified.

4 To return Winamp to normal operation, where it will play MP3 files, go back to the Preferences menu and under Output Plugins select either Nullsoft DirectSound plug-in, if your sound card has DirectX drivers, or select Nullsoft waveOut plug-in, if it is an older card that does not (see [screenshot 3](#)).



Screenshot 3



The idiot's guide to ripping MP3s

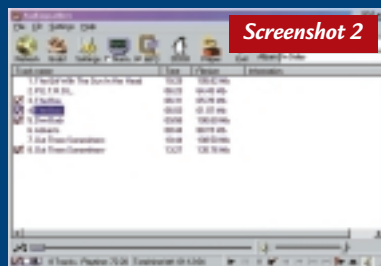
1 Download Audiograbber from www.audiograbber.com-us.net – it's a 1.3MB file. Install Audiograbber into c:\audiograbber.

2 Next, download the BladeEnc MP3 encoder DLL file from <http://bladeenc.mp3.no>. The file you need is only 141KB in size and is called BladeDLL-0XX-intel.zip, where XX corresponds to the version number. Unzip the contents of BladeDLL-0XX-intel.zip into the same directory as you've installed Audiograbber (c:\audiograbber).

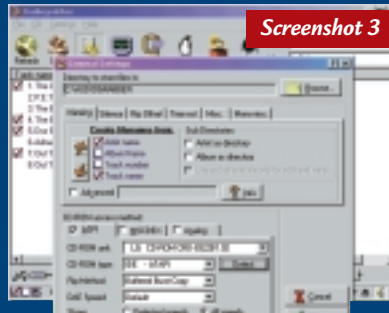


3 Run Audiograbber. Place an audio CD in your CD-ROM drive. If you have a modem installed you can click on the button with the picture of a penguin on it. This will start your Internet connection and download the name of the album, artist and all the names of the songs from an Internet database called CDDB. If you don't have an Internet connection, don't worry, you can just type in the name of the song by double clicking on the track number (see screenshot 1).

4 Because this is the trial version of Audiograbber not all the songs will be available for copying. Those that are, have a box next to the name of the track. Choose one of these by clicking

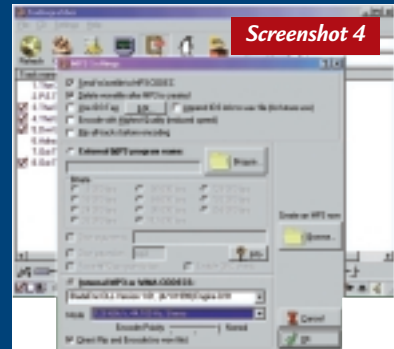


in the box next to its name so that a tick appears in the box. Make sure you've only selected one track (see screenshot 2). I've chosen Orbital's *The Box*.



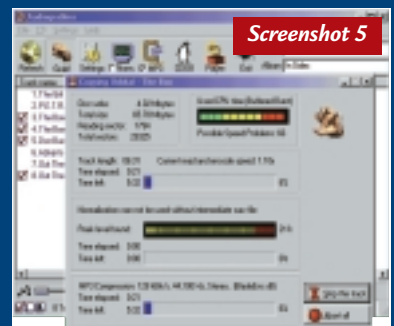
5 Click on the Settings button with the picture of the cog wheel on it. This will bring up the main settings window (see screenshot 3). Under 'CD-ROM access method' there are three choices. Not all of these will be available. If the MSCDEX or ASPI options are available click on one of these. Both of these options allow the CD-ROM to read the raw digital data directly off the CD at faster than normal playback speed. This also means that your recording will be slightly better quality. If neither of these options are available, or if you experience problems with them, click on the analog box. This will sample audio in real time as it is played through your sound card. All CD-ROM drives support this option, but make sure that your sound card is set up to record from the CD-ROM player under your sound card's mixer application. From this main Settings window you can also change the directory that your final MP3 file will be saved in by clicking on the browse option. I've left it at c:\Audiograbber. Click OK to exit the settings menu.

6 Click on the MP3 button with the picture of the clamp on it. This will bring up the MP3 settings window. Make sure that the following options are ticked: 'Send Wav file to MP3 Codec' and 'Delete wav file after MP3 is created' (see screenshot 4). Also make sure that you click the 'Internal MP3 or WMA codec CODECS' box and that you have selected the BladeEnc DLL in the box under it. In the Mode box choose 128Kbits/sec, 44,100Hz, Stereo. Tick the 'Direct Rip and Encode (no wave file)' box. Click

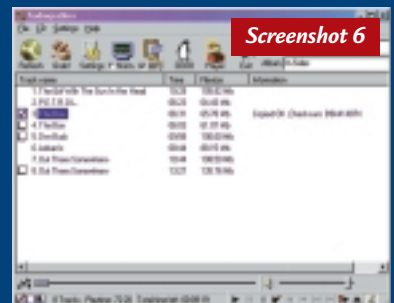


OK to close the MP3 settings window.

7 Click on the Grab button with the picture of the hand on it. The program will first copy and then encode the audio on to your hard drive (see screenshot 5).



8 The encoding has now finished (see screenshot 6) and you'll find the MP3 file in your Audiograbber folder.



CONTACTS

Niall Magennis welcomes your feedback on the sound column. Contact him via the PCW editorial office or email:

sound@pcw.co.uk

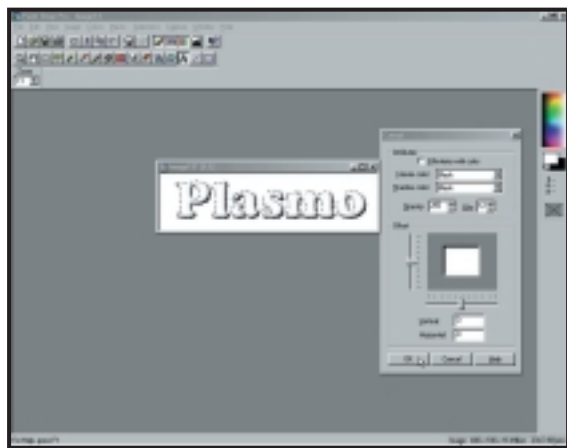


In full effect

Ken McMahon has some textual tricks to **set your words ablaze**, or put them up in neon lights...

Text effects have become ubiquitous. On the Internet you can't go far without bumping into type that's had anything from a neon glow to molten metal poured over it. It's easy to go over the top with text effects, but – as a glance at the cover of this or any other magazine and most adverts will confirm – even a humble drop shadow can give type a visual lift.

Both bitmap and vector packages now offer single-click text effects and there's a wealth of plug-ins to turn tame type into whacky wording. But, as you'll see, you can quickly produce stunning text effects using basic tools. Here I've included step-



Applying negative cutout to get the raised plastic effect

mode from the pulldown menu on the layers palette to colour dodge. Apply Gaussian blur, setting the pixel radius to around three.

Duplicate the blurred text layer and – making sure the preserve transparency box

slightly so it looks like the flames are rising out of the wording. Next, apply the ripple filter on medium with a value of around 200. Lastly, duplicate the red text/flame layer and change the colour to orange using Image, Adjust, Hue, Saturation (Ctrl & U), then offset the orange flame layer to get the best effect. Finally, add a levels-adjustment layer and gradually adjust the input-level slider until the background is completely black.

Photoshop: Neon text

Create a new document in the same way as for the fiery text. Then type in your chosen words using a suitable font – outline, rounded and script fonts work well for neon, I've used Mistral. Load the font outline as a selection, by control-clicking the type layer in the layers palette, then create a new channel called neon glow and stroke the selection with a two-point white path. Deselect (Ctrl & D) and apply Gaussian blur with a radius of around one to two pixels, although this depends on the font. Pull up the curves dialog (Ctrl & M) and adjust the curve to a sine wave shape.

In the layers palette, turn off the original type layer, create a new layer, load the selection from the neon glow channel and fill it with whatever colour you like.

Paint Shop Pro: Chrome text

To get that chrome lettering effect, create a new document 400 x 100 pixels. Choose a white background and select 16.7 million colours as the image type. Make sure that antialias and floating are checked. Select the text tool and type your text in the dialog box using a suitable font – I've used Copperplate –

It's easy to go over the top, but even a humble drop shadow can give text a visual lift

by-step instructions for producing five simple yet quite striking text effects, three in Paint Shop Pro 4.15SE, which was on the PCW, December 1999 cover disc, and two in Photoshop 5.5. You can adapt them to produce variations on a theme and, if your editing package has scripting support, record them so that you can apply the same effect to other text in an instant.

Photoshop: Fiery text

Make sure the background colour is set to black and create a new document 400 x 100 pixels, with contents background colour checked. Create a new layer and fill it with 75 per cent black. Using the text tool, type in your text using a suitably fiery font and set the colour to white. If necessary click the faux-bold check box to give the characters extra weight. Render the type by selecting Layer, Type, Render Layer and set the blend

is checked – fill it with red. Uncheck preserve transparency and apply the motion blur filter to the layer with an almost vertical angle and a value of around 40 pixels, then move the layer up



Keep a fire extinguisher handy for this one!



Adjusting the curve for that neon effect

3D plastic treatment. This document was created at a size of 900 x 900 pixels.

The bomb was first rotated by 330 degrees and the cutout settings were opacity 255, blur eight and

it will need to be around 36 points.

From the Image menu, select Special Effects, Hot Wax coating and apply it three times. Then press Ctrl & H and apply a feather of four pixels, before applying the Hot Wax coating twice more. Finally, from the Image menu, apply Normal Filters, Sharpen more two or three times. Bear in mind that the number of applications of the filters and the degree of feather you need will depend on the size and resolution of the file.

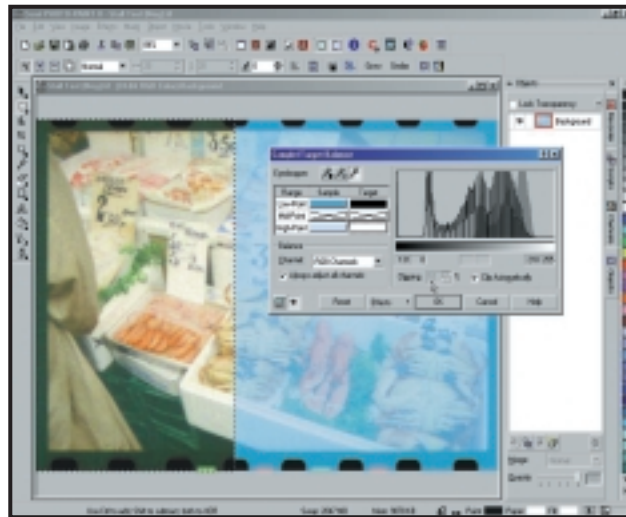
Paint Shop Pro: 3D text

To give words a 3D plastic look, first create a new document as for the chrome example and type in your text. Choose a heavy typeface with rounded edges – I've used Cooper black. From the Image menu choose Special Effects, Cutout. Uncheck 'fill with colour', set the opacity to 80, blur to 12 and the vertical and horizontal offset both to minus three, then click OK. Apply the emboss filter, from the Image, Special Filters menu and add colour using the colourise dialog box (quick key: Shift & L). Finally, select Special Effects, Drop Shadow – colour black, opacity 125, blur 25, with vertical and horizontal offsets both at four.



Icons from symbol fonts

By applying effects to characters in symbol fonts you can quickly create striking icons to populate web pages or printed publications. The bomb icon (see above) is the uppercase M character from the webdings font that has been given the



Eliminating the negative blues in PhotoPaint 8

both offsets at minus five. Incidentally, once you've created the type selection, you can save it under Selections, Save. You can then reload it if you accidentally deselect it, or you can change the settings – such as choosing a different colour. Also, if you want to create type for both print and web use, you can produce it at a high resolution and then sample it down.

Orange filters

I get a lot of queries about scanning techniques, but Tony Almond wrote in with a particularly interesting one:

'As you know, colour negatives have an orange-coloured filter in them (why, I am unsure). I scan these on an HP flatbed scanner, using a slide adaptor and I've tried dealing with the image using several packages (currently PhotoPaint 8).

'I cannot successfully convert the

image into a properly-coloured picture. Because of the orange filter in the film, reversing the colours gives everything a blue tint that I can't readily remove!'

Tony can't find the answer online or in any of the manuals he has consulted. He's especially interested in getting better results with the CanoScan FS2710.

The orange mask is actually there to prevent fading of the dyes in the negative from exposure to light. As Tony has discovered, inverting the colours inverts the mask as well and you get a blue cast. There are a variety of scanners which can correct for the mask during the scanning process, including Linotype's professional flatbed range, The Nikon Supercoolscan

2000, the Agfa DualScan T2000XL and the CanoScan FS2710. Even my humble Umax Astra 1220S, which uses VistaScan v2.4.3, has a negative option.

If your scanner doesn't have this option all is not lost. You can get good results by resetting the black and white point in the inverted image. Scan the negative as you would a transparency then, in PhotoPaint 8 select Image, Transform, Invert. Next select Image, Adjust, Sample, Target Balance. Using the black eyedropper, click in the

rebate area of the negative, or on any point of the image you know should be black. Use the white eyedropper to select the white point in a similar fashion. Click on the Low Point Target swatch and click the more button in the Select Colour dialog. Enter values of zero in each of the R, G and B boxes. Do the same for the High Point Target swatch, this time with values of 255 for each of the RGB components.

It's much simpler in Photoshop. Just press Ctrl & M and click on the relevant shadow and highlight area using the appropriate eyedropper.

CONTACTS

Ken McMahon welcomes your feedback on the Graphics & DTP column. Contact him via the PCW editorial office, or email:

graphics@pcw.co.uk



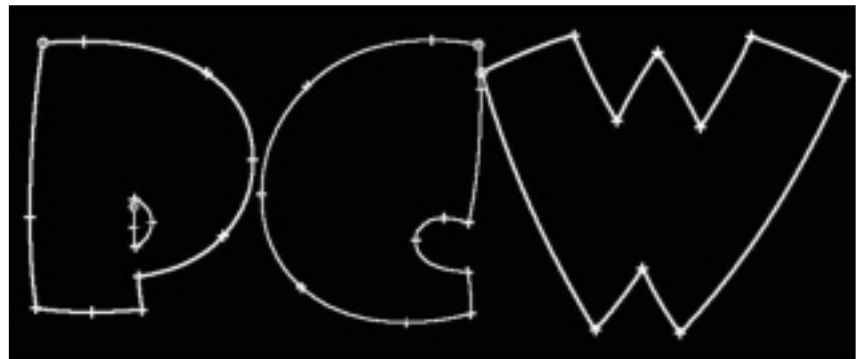
Bending the letter

Benjamin Woolley chips away at **some familiar 3D text** to produce curvaceous Boolean bends.

You might think that text is as relevant to creating 3D graphics as smells are to composing music. These are two fundamentally different media. Obviously, 3D graphics is about pictures and text is about words. But text constantly crops up in 3D scenes, often in the form of company and product logos, sometimes within signs imparting information, even on the pages of virtual books (as featured in several games, notably *Myst*).

This month I want to look at some of the ways text can be used in 3D graphics, with an exercise based on my unofficial (and uninvited) revamp of the famous PCW logo.

First, though, we need to consider how text appears in 3D scenes. It takes two entirely different forms. In signs and suchlike, it is usually applied as a material to a 3D object, such as a flat plane or cube. This is the quickest way of introducing letters and numbers into a scene. For example, if you have created a model of a car and want to add a number plate, it makes sense to add the registration number as a bitmap. This is easily done, as most paint programs include some sort of text tool, and these



Screenshot 1: The shapes of the letters used to create the new, fun PCW logo. The tick marks show the positions of the vertices that determine the curvature of the shape

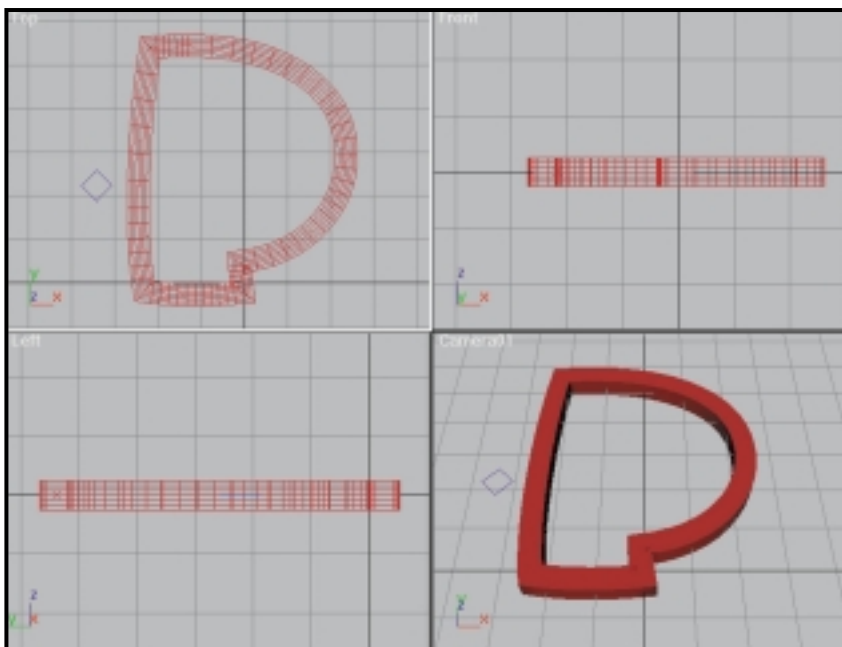
days many of these tools use TrueType fonts to generate the letters, providing a wide range of typefaces to experiment with. You simply insert the text you want using the appropriate font onto an empty background (or a textured one, for that matter, if your paint program allows for this), save it as a bitmap, and apply it as a material to the object that will display the text in the final render (such as an oblong shape with the dimensions of a number plate).

There can be complications with

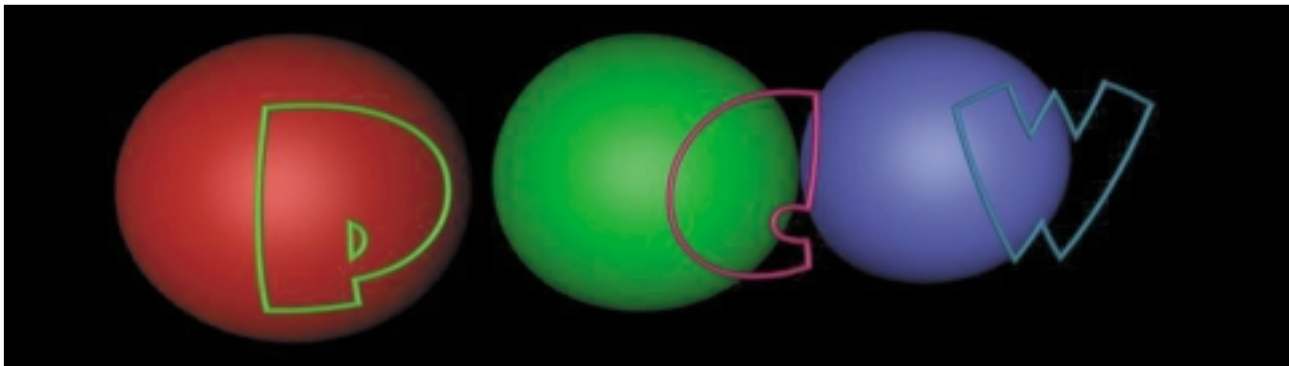
applying text as a material. The main one is that the material can become distorted or blurred by the way it is mapped onto objects. If, continuing with the number plate example, the bitmap applied as the material is of a low resolution, and the number plate at some point fills the foreground of the scene, the letters and numbers might become blurred. So it is best to establish in advance roughly how many pixels the text will take up in the final render, and make sure the bitmap is of an equivalent or greater resolution.

You will also have to consider the shape of the object to which the bitmap containing the text is to be applied. Fonts do not respond well to being stretched or twisted, so you will either have to create a bitmap with the same aspect ratio as the surface it is being mapped onto, or apply the bitmap as a decal (like a sticker). If you choose the latter, you may also need to think about applying a texture beneath the text, which means generating an original bitmap with a transparent background. For best results, this means using a paint program that supports alpha channels (also known as masks), and saving the bitmap in an appropriate file format (eg as a .tiff file).

The other approach to adding text to a scene is to add it as geometry. All the 3D packages I know include some sort of



Screenshot 2: Here the outer line of the P shape has been used as a path to 'loft' a square shape. The resulting model could be used in conjunction with a Boolean subtract operation to engrave the P outline into a model of a block of stone



facility that enables you to do this, and many of them, like the paint programs, can generate the letter forms using TrueType fonts.

This was the approach I took when creating my Toytown version of the PCW logo. **Screenshot 1** shows the letters as they are first created. They are basically curved lines or 'splines' with vertices (indicated by the tick marks) which can be manipulated to control the shape of each segment. Using spline editing tools, you can alter the shape of each letter you create as much as you like, a level of flexibility not possible using a paint package. The letters used in this experiment were based on a tubby TrueType font called 'Beesknees'.

geometry. One option is to 'loft' a 3D object using the letter as the path, and another shape as the cross section.

Screenshot 2 shows the result of using the outline of the letter P as a path with a square cross section. Note that the P shape is in fact made up of two splines, one for the outside of the letter, the other for the inside. I had to delete the inner spline because a lofting path can comprise only a single, continuous line.

The results of this lofting process can be used in various ways. One that is particularly effective is engraving. If you loft all the shapes that make up the text you want to insert, you can then use a Boolean operation to cut the shape of the lofted letters from, say, a slab of

Screenshot 3: These are the three letter shapes set before three hemispheres. The aim is to produce 3D letter objects with the curved contours of the hemispheres

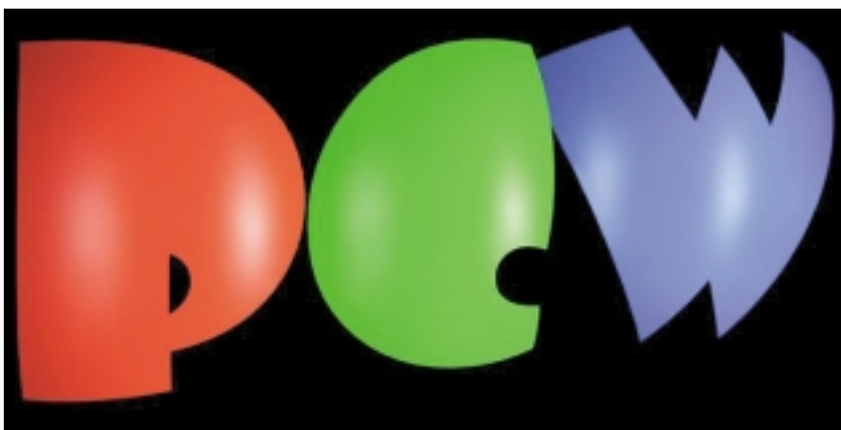
better with complex or disorganised geometry than those using bitmaps.

You can, of course, produce engravings by applying a bitmap of the same text as a bump map. This will be quicker and more efficient, but you will have less control over the finished result.

I decided to use my letters to create a different sort of geometry (**screenshot 3**). I used each letter form as a sort of cookie-cutter. Different 3D packages offer various methods for doing this. It can be achieved using a Boolean operation. First, you would extrude the letter shapes to create three blocks with the letter shape as the cross-section. For each letter block, you create a hemisphere that is wider but not deeper than the block, using a Boolean intersection operation. This leaves the block with the upper surface curved to the contours of the hemisphere.

I did something similar using a 3D Studio MAX modifier called ShapeMerge, which enables you to use a shape as a sort of cookie-cutter. This meant I ended up with just the curved surface of each letter, as opposed to an entire block (see **screenshot 4**).

These are by no means the only ways of using text in 3D scenes, there is endless scope for experimentation. One rule, however, applies whatever you do: before you perform that geometry-destroying Boolean operation, or the final high-resolution render, check your spelling.



Screenshot 4: The finished result. The highlights on the surface of the plastic material applied to the objects emphasise the letters' tubby shape

Having chosen a font, inserted the letters into the scene and messed about with their shapes, the next decision is deciding how to turn them into 3D models. The shapes on their own won't render (or if they do, only as outlines). They are simply 2D lines. To turn them into proper renderable surfaces, you need to use them to generate some 3D

stone (ie a slab-shaped object textured as stone). If you want to do this, bear in mind that such complex Booleans don't always produce very tidy geometry. This in turn can create some texturing headaches, as you may find that the resulting object has stray faces. One possible solution to this is to texture the slab with a 'procedural' material. Most 3D packages include a marble or woodgrain procedural, that mathematically calculates the way the grain will appear in the object to which it is applied. Such materials often cope

CONTACTS

Benjamin Woolley welcomes your comments on the 3D Graphics column. Contact him via the PCW editorial office or email 3d@pcw.co.uk



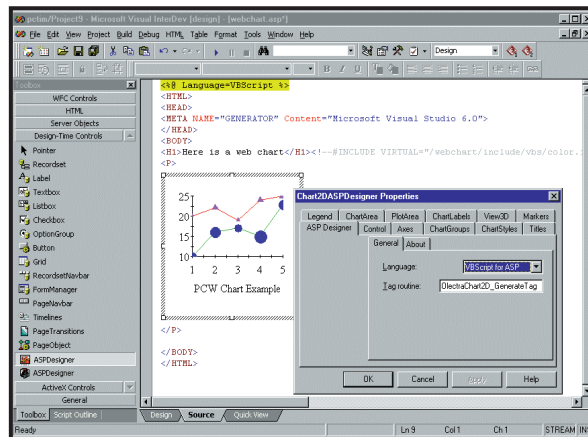
Chartist movement

Tim Anderson looks at an app that turns an **ActiveX control** into a cross-platform component.

Apex Software's True WebChart component is a sign of the times. It claims to be version 6.0, but is really version 1.0 of the WebChart component. The reason for the numbering is that True WebChart is Olectra Chart in another guise. The previous incarnation is a well-established ActiveX charting control. True WebChart is an ASP (Active Server Pages) server-side component for displaying charts in web pages.

The interesting point is that converting an ActiveX charting control to an ASP component is, in principle, very easy. The output from a charting control is an image. All web browsers understand images, so the ASP script only needs to drive the charting object, get it to save an image, and serve the image back to the browser.

This is exactly what True WebChart does. You also get a design-time control for Visual InterDev. Design-time controls are a little mysterious at first, so here is an explanation. Visual InterDev is a RAD environment for building ASP pages. If you include a COM object (such as True WebChart in an ASP script) then, depending on what sort of object it is, you may well end up with reams of code setting its properties. True WebChart is a good example, with over 100 lines of code used simply to define a default



Behind the mystery: the default view of a design-time control in the Visual InterDev source editor

chart. The design-time control is an ActiveX component that generates this code for you, using properties set via a familiar property sheet dialog. When you view the source, you see by default a visual representation of the object.

If you right-click and choose View run-time text, then the generated script is displayed below it. This is pretty much essential for debugging. You cannot edit this script, other than by going back to the property sheet. If you need to tweak the code in ways that go beyond what the design-time control can achieve, there is an option to Convert to run-time text. This deletes the design-time control but leaves

the generated script, now in read-write form. There is no turning back since you cannot recover the visual control. The system works well, saving time and reducing errors.

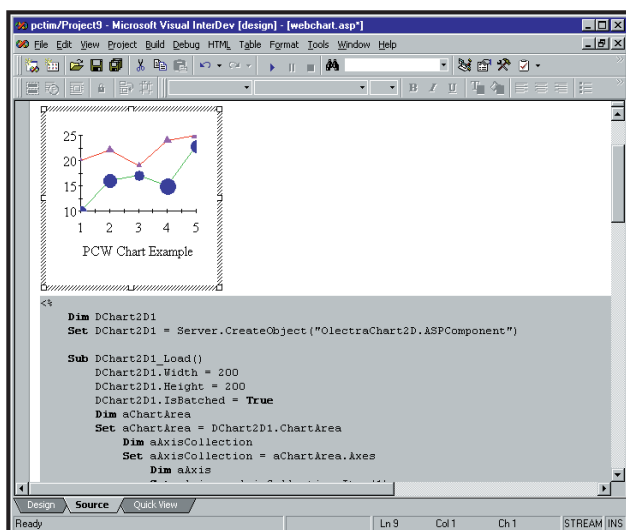
Going back to True WebChart, I

In the half-way house view, the generated code shows underneath the control

on the web for help, where I discovered an Olectra chart newsgroup, three users with the same problem and no answers, a classic newsgroup scenario.

Careful debugging showed that True WebChart was not actually saving any temporary files. The idea is that if the ASP script detects Internet Explorer, then it saves a properties file for a client-side ActiveX control. The error message meant that the control was attempting to load a non-existent file. If the script detects Netscape or other browsers, it tries to save an image, and this was generating a broken link as the image file did not exist. The problem turned out to be one of permissions. True WebChart managed to set itself up with a directory for temporary files that was read-only. In the case of the demo web pages, there was no application defined in Internet Information Server so the ASP pages could not run. Both problems were easy to solve using the Internet Service Manager, and once this had been done everything started working.

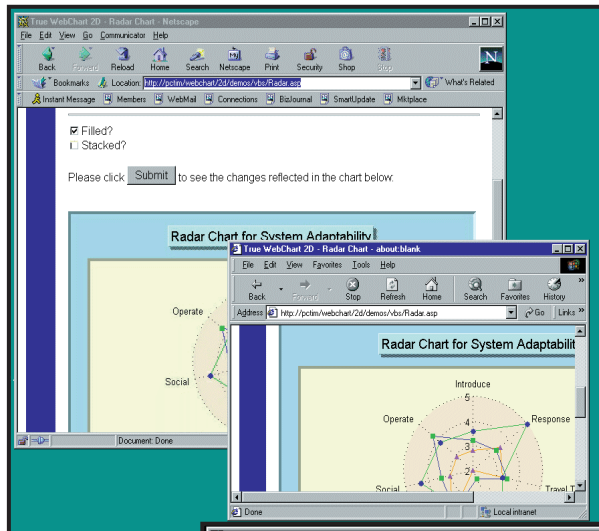
True WebChart lets you control whether Internet Explorer gets a plain image like Netscape, or uses an ActiveX control. Visually, both produce the same results. The ActiveX client has some advantages. The user can right-click the control, and get the same property sheet that appears at design-time. If you want the user to be able to change the chart



from Radar to Pie, this is a great advantage. Another factor is the download time. Admittedly, the ActiveX user has to install the control before the charts will display, which could involve over a megabyte of CAB files, but once completed a typical chart is under 2K in size, whereas the equivalent JPEG image is around 70K.

On web pages for internal use, the ActiveX version wins, but for public-facing sites the simplicity of image generation has more appeal.

The end result is a rich data-aware charting control that is ideal for creating impressive cross-platform web applications. There are 2D and 3D chart types, with support for bubble, HiLoOpenClose to display stock prices, candle, polar and more. The 3D chart lets you control rotation, perspective and orientation, as well as all the properties you would expect, such as colour, border and legend. The package includes full OCX controls for Visual Basic, Visual C++ or Delphi, along with a DLL version for use if you prefer to avoid ActiveX. The caveat is that since the installation went wrong so easily, there is the worry of further bugs that might emerge. There is food for thought here too. The power of ASP is that some native Windows applications can convert remarkably

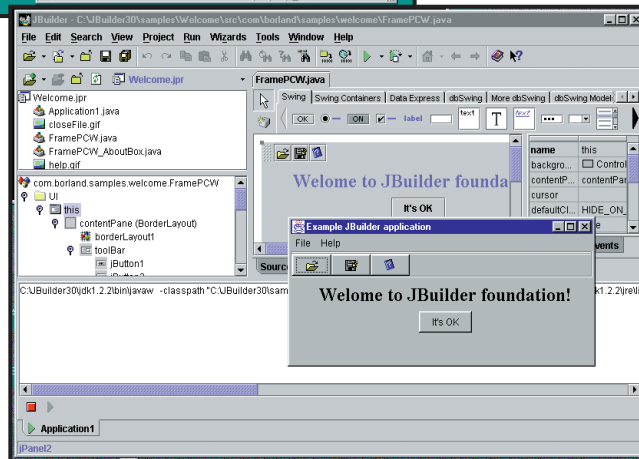


Netscape has loaded True WebChart bitmap, but Internet Explorer uses a client-side ActiveX. There is no visible difference

JBuilder on Linux, the recently released Solaris Enterprise edition also runs, provided that you install the latest JDK as above. Be warned that JBuilder is still frustratingly slow on most systems, the main barrier to high productivity.

The next big news is that Interbase, the Inprise client-server database, is becoming an open-source product. Exactly what this will mean is not clear at the time of writing, but a likely scenario is that Interbase will be available for free

deployment on an unsupported basis, the code will be available for download, and Inprise will retreat from investing in Interbase development while still hoping to profit from support contracts and related products. In a way it represents both good and bad news for Interbase. It reflects lack of



Builder's cracked: Versions of JBuilder Foundation for Windows, Linux and Solaris are free to download – this is the Win98 version

wizards, and some debugger features. Even so, it gives you a professional visual design tool for Java that can be run on Windows, Linux or Solaris, including drag-and-drop Swing components.

success in winning market share against the likes of Oracle and Microsoft SQL Server. Interbase is a good product though, and pushing it out to the Linux and open-source community can only increase its popularity.

An Inprise product that stands to benefit from a freely-available Interbase is Kylix, the codename for Delphi running on Linux. Developers using Linux are already well served by GNU C/C++ among other tools, but there is nothing like Delphi for rapid visual development. Delphi for Linux will attract both existing Linux developers and Windows developers who like the idea of creating applications for a platform that is free to deploy. There is going to be pain in porting from Windows to Linux, even if it is Delphi to Delphi, unless Inprise plans to port the whole Windows API complete with COM and ActiveX, which I doubt. Even so, it brings closer the possibility of deploying Linux on the desktop as well as

All platforms are not equal in the Java world, and in practice Solaris and NT get priority

easily to cross-platform web solutions, provided you are willing to run Internet Information Server on NT.

Revolution at Inprise

Inprise, or is it Borland, is embracing Linux. There are three significant events that signal this. One is that JBuilder, the RAD Java tool, has been released in a free version called JBuilder Foundation. This is a no-frills JBuilder IDE without the JBCL (JavaBeans Component Library),

JBuilder's new cross-platform talents indicate that it is now itself a pure Java product, so it will run on any compatible JVM. Compatible in this instance means JDK 1.2.2 or higher. All platforms are not equal in the Java world, and in practice Solaris and Windows NT get priority, while Inprise with others has made a special effort to help in providing JDK 1.2.2 for Linux. JBuilder Foundation also just about runs on Windows 95 or 98. Incidentally, if you want a full-featured



on servers, with custom Delphi applications accessing Interbase. Another possibility is to develop web applications using Apache and Interbase, accessed by clients on any platform – much as described in this month's *Web Development* column. Windows has advantages as well, but the number of situations in which Linux is a viable alternative is increasing.

ASP components

For years Microsoft has been urging those involved in Windows development to build applications with COM components. While this has caught on to some extent, developers have resisted, for many good reasons. Every COM component has to be installed and registered in the Windows registry, making deployment more difficult and error-prone. COM itself is complex, and while tools like Visual Basic simplify some issues, others have a labyrinthine complexity. Threading models, object lifetime, managing state and preserving compatibility are some of the trickiest areas. Distributed COM (DCOM) is powerful but brings new

application between presentation, middle-tier logic and back-end data is essential if you need to support a variety of platforms, from Windows clients and browsers, to handheld devices. The next Visual Studio will let you create web services, COM objects that can be accessed by sending and receiving XML, a realistic proposition for almost any device. Windows, of course, is not the

MTS has been renamed Component Services, showing how important it has become

difficulties. The safe path has been to use Delphi or C++ to write traditional Windows applications, keeping as much code as possible within the executable and DLLs (Dynamic Link Libraries) that you supply.

While this reasoning still has some force, the tide has turned. The implementation of COM in Windows has improved over the years. One reason is that Microsoft's own applications rely on it heavily, so it has to deliver reasonable performance and reliability to keep Microsoft Office running. The other factor is Internet technology. Browser-based applications make increasing sense in the web era. Partitioning an

only game in town, and in particular Java objects such as Enterprise JavaBeans are travelling the same path.

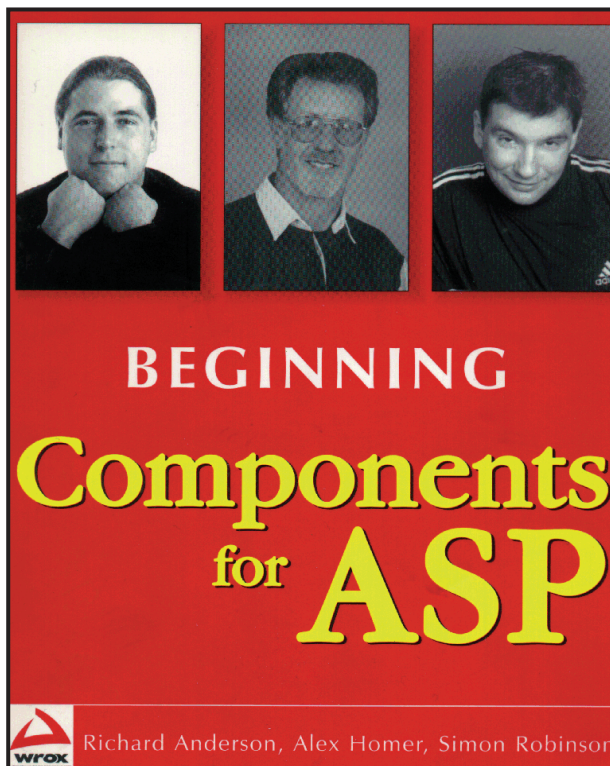
Getting started with component development is not particularly easy. It means a new application architecture, as well as coming to terms with new technology. There are some very good books covering how to do this. One good one is from Wrox press, which has published a number of titles on how to build COM applications. The one in my hands is *Beginning Components for ASP*, which, despite its title, is not just for novice programmers. As well as the focus on ASP, it is also useful for any Windows developer wanting to understand how to

Beginning Components for ASP: an excellent guide for novices and pros

create COM applications. The first two chapters cover the basics of COM components and building them in Visual Basic. Further chapters tackle data access through ADO (Advanced Data Objects) and multi-tier application architecture. MTS (Microsoft Transaction Server) is covered in detail. This is the application that manages COM objects, sharing them sensibly when there are a large number of clients and supporting transactions for robust data access. One of the problems posed by MTS is that components should be stateless, which means they do not store data such as the current record, or the identity of the client. In a stateless component, such information is used by the components methods, but not stored in global variables or

properties. This means that state has to be stored in other ways. In Windows 2000, MTS has been renamed Component Services, showing how important it has become.

The more advanced sections of the book tackle: Microsoft Message Queue, which is a robust mechanism for communication between distributed components; working with the Active Directory; and how to create lightweight components using ATL (the Active Template Library) in C++. Finally, there are two detailed case studies, one covers a document management project and the other is a cinema booking application. If you are planning a Windows application that is aimed at more than single users, this is exactly the kind of information you need to absorb.



CONTACTS

Tim Anderson welcomes your Visual Programming comments and queries. Contact him at visual@pcw.co.uk, or via the PCW editorial office (address on page 10). Download JBuilder Foundation from www.borland.com True WebChart 6.0 costs £499 (ex VAT) from: Contemporary 01344 873434. More information at www.contemporary.co.uk

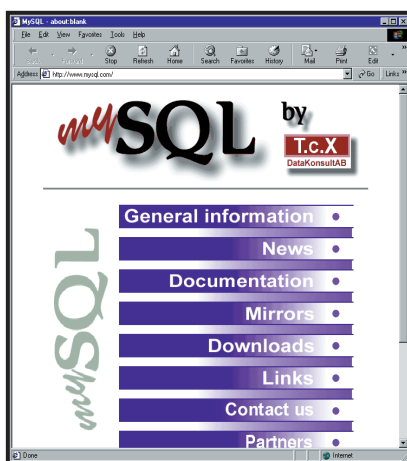


Uniquely Unix

Tim Anderson takes the Unix approach to **data-driven websites** with open-source applications.

In the last few columns I have looked mainly at using Active Server Pages (ASP) to create data-driven websites. ASP is ideal for Windows developers, but less useful on Unix-like operating systems. Fortunately there are other options. A great solution is the combination of PHP (which in some curious way stands for Hypertext Preprocessor) and a database such as MySQL.

These products are children of the Internet era. PHP started off as a parser, written by Rasmus Lerdorf for his home page. It has been worked on since by many others and is now available under



MySQL is proving popular as a web database

the GPL (GNU General Public License). MySQL is mainly written by Monty Widenius, with support from the Internet community. Both are open-source products. MySQL has its own licence, which is complex because the terms for Windows are different (and less favourable) than for other operating systems. However, MySQL is free for use on web servers running on non-Microsoft operating systems. PHP and MySQL are available for Windows, but ASP is the natural choice on Windows.

Getting started

The PHP/MySQL combination could prove useful both on an intranet and the Internet. It is worth getting an intranet solution working, if only to make it easier to design an application before moving it to a remote ISP. My suggestion is you install Linux on a spare computer, hook it up to your network, and install Apache, PHP and MySQL. I use SuSE Linux, which comes with MySQL and Apache pre-configured with PHP support, and the same may be true of most recent Linux

distributions. The other option is to visit the PHP and MySQL websites and download the latest versions. You can download binary or source installations, with the latter recommended if you want to be right up-to-date. The websites and documentation offer beginners plenty of tutorials and advice, so even compiling your own source is usually not too challenging.

Output from PHP/MySQL running on a Linux intranet server

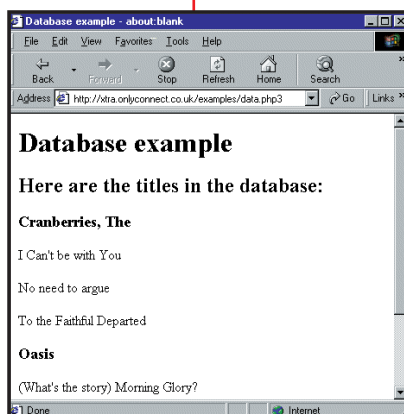
If you don't have a spare machine, you can dual-boot Linux and Windows. In this case, however, stay with Windows and install the Windows versions instead.

FIG 1

PHP code to query a MySQL database

```
<HTML>
<HEAD>
  <TITLE>Database example</TITLE>
</HEAD>
<BODY>
<H1>Database example</H1>
<H2>Here are the titles in the
database:</H2>
<?php
$conn = mysql_connect();
$db = mysql_select_db("test",$conn);
$result = mysql_query("select * from
titles,artistid
= artists.id order by name, title",$conn);
if ($result) $numrows =
mysql_num_rows($result);
if ($numrows == 0) {
echo "<p>No results available</p>";
exit;
}
$artistname = "";
for ($i=0; $i < $numrows; $i++) {
$newname = mysql_result($result,$i,"name");
if ($newname != $artistname) {
echo "<h3>" . $newname . "</h3>\n";
$artistname = $newname;
}
echo "<p>" . mysql_result($result,$i,"title") . "</p>\n";
}
?>
</BODY>
</HTML>
```

(Key: ✓ code string continues)

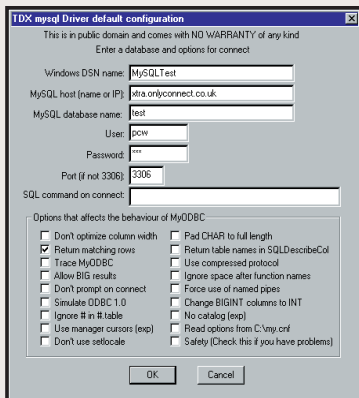


Access to successful data transfer

While there is nothing wrong with MySQL's command-line tools, it is also useful to work with a program such as Microsoft Access, to get things such as graphical report tools and the ability to view tables in scrolling grids. Using the MyODBC driver, you can attach MySQL tables to an Access database. First, download and install the driver from the MySQL site. Next, configure the driver (see **screenshot right**), ensuring that the Return Matching Rows option is checked.

You should also check that the named database exists on the MySQL server. If you are connecting across a network, MySQL needs to be configured to accept the specified user connecting from the host on which the

ODBC driver is located. You do this by adding an entry to the MySQL user table for the host, user, password and permissions combination.



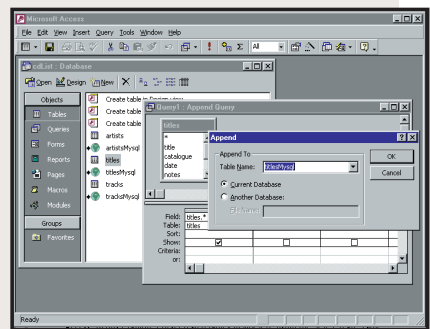
Set up the MySQL ODBC driver to use it with other Windows apps

On an intranet, you would typically use `%yourdomain.co.uk` to allow connections from any internal host.

Once the driver is set up, you can get at the MySQL data from any ODBC client. MsQuery, which comes with

Office, is a useful general ODBC client from which you can execute SQL statements. In Access, open a database and choose File, Get External Data, Link Tables to attach MySQL tables. As long as the tables have a primary key defined, you should get a read-write connection.

The screenshot above shows how to use this feature to copy data between MySQL and Access. In this example I first created tables in MySQL using the SQL Create Table command, with field names and types to match those in the Access database. Next, open a query and add the table you want to copy. From the Query menu choose Append Query, and select the matching MySQL table as the target. As a further refinement, choose



Once a MySQL table is attached to Access through ODBC, it is easy to exchange data. In this example, MySQL is running on Linux

View, SQL view and add the clause:

```
'WHERE yourtable.ID NOT IN (SELECT ID from yourtableMsql)'
```

In this example, the ID field is the primary key. The advantage is that records will only be added if they do not already exist. You can do the same in reverse, to copy data from MySQL to Access.

This way you can run MySQL at the same time as other Windows applications, making it easier to transfer data (see panel above).

MySQL is not as sophisticated as SQL Server or Oracle. For example, it does not yet support transactions, stored procedures or subqueries. But it is fast and stable. As its name implies, it is an SQL database server, and the supplied administration tools are command-line utilities that accept SQL statements. Much MySQL documentation is an SQL reference. You need to learn SQL to work with MySQL. The ODBC driver is a handy route to more user-friendly data management.

Using PHP

PHP works on similar principles to Active Server Pages. In both cases, the source HTML is processed on the server before being delivered to the browser. The big advantage is you can include dynamic content without needing to run scripts or

applications on the browser client.

The first thing to know about PHP is that, like ASP, it uses script delimiters. The safest delimiter to use is like this:

```
<?php echo "Greetings" ?>
```

The command `echo` simply outputs the following string to the browser.

The next thing to know is that the scripting language is loosely based on C. For example, `'='` is the assignment operator while `'=='` is for comparisons. Variable names are case-sensitive and begin with a `$` character. Download the manual in HTML format, pop it on your local web server, and you have a ready online reference.

Figure 1 is an example of how you might use PHP to query a database. It used PHP's built-in support for MySQL. The function `mysql_connect` sets up the connection, but may need arguments for username and password. The next two commands select a database and perform a query. The command `mysql_result` retrieves the value of a

particular field in a row. There is a `mysql_close` function, but no need to use it as the connection is automatically closed when the script ends.

Here's a PHP tip: include the line: `<?php echo phpinfo(); ?>` to retrieve a comprehensive table of how PHP and the web server are configured.

There will be a further look at how to make PHP/MySQL interactive using forms and searches next month.

CONTACTS

Tim Anderson welcomes your web development queries, at webdev@pcw.co.uk. You can find this PHP example in the Hands On section on this month's CD-ROM. The home page for PHP is at www.php.net. The home page for MySQL is www.mysql.com. There are numerous mirror sites. If your ISP supports PHP and MySQL, check for specific information on how it is set up as this varies.



Revenge of the four-eyes

Mark Whitehorn decides to hold off on **corrective surgery**, as specs could be the next big thing.

Having been seriously short-sighted from birth, and suffered the slings and arrows of my contemporaries in the playground, I've been tempted for some time by the promise of laser treatment for eye defects. However, thanks to the PDA, I'm holding off because it looks as if spectacles could shortly become the new fashion essential of the millennium!

The wearable computer (WC? – surely not) has been getting a great deal of attention on the Internet recently. Try www.wearables.net as a great starting point. Wearable computers come in all sorts of shapes and sizes and are set to have a whole variety of functions. In fact, it is one of the joys of a totally new field that many of the important areas have yet to be set in stone. Will the major



There's that NASA technician using a WC to inspect the grouting between the tiles

research sites in California, I got to play with a wearable computer. It consisted of a box clipped onto my belt, a headset

I saw a normal-sized screen floating perhaps two feet in front of me

input device be a trackball held in the hand, a data glove or something that tracks eyeball movement? However, one area that is reasonably certain is that output is likely to be audio (into the ears) and visual (into the eyes).

During a recent trip to Almaden (www.almaden.ibm.com), one of IBM's

and a trackerball-type pointer sitting in the palm of my hand. The headset contained headphones and a projector that squirted an image directly into my left eye. I presume the image is directly focused in some way, because what I saw was a normal-sized screen floating perhaps two feet in front of me. The

quality was lower than we are used to (I'd guess it to be about CGA/EGA quality) and it showed a GUI interface, complete with pointer. Moving the pointer with the trackball enabled me to click on an icon and watch a cartoon complete with soundtrack.

For a gadget

freak this was seventh heaven, but it had some disadvantages. For a start, my two eyes collaborated to show me a screen floating in mid-air, but they were lying. The projector in front of my left eye more or less filled the visual field, so that eye was seeing nothing except the 'screen'. This means that I had lost most of the normal depth perception in the real world and avoiding large moving objects (such as one tonne cars travelling at 30mph) would have been more taxing than usual.

However, on the wall of the lab was a picture of a pair of spectacles with a transparent screen hanging invitingly in the glass of the left eye. The IBMers couldn't be drawn into producing the real thing for me to try, but they did hint that it is more than virtual. (Incidentally, there is another fascinating site, not just for wearables, but small computers in general – fancy a web server the size of a box of matches? Try: <http://wearables.stanford.edu>.)

I know that users of hands-off phones are already wandering around the streets apparently talking to themselves (the first one I came across was standing next to me in a bookshop; I genuinely thought he was demented until I saw the wires... even then I wasn't sure). I think it unlikely, however, that it will become fashionable to walk around wearing a headset and blind in one eye (the lawyers will have a field day). Those designer shades are the answer, so I am holding off on the laser treatment bit for the time being.

But what have wearable computers got to do with PDAs? It's a fair question and one that seems to have escaped the keen advocates of these new gadgets. The sites are full of interesting projected uses for these machines. The NASA site (www.ksc.nasa.gov), for example, envisions technicians using them to help with the task of checking all the ceramic heat-tiles on a used space shuttle. I do



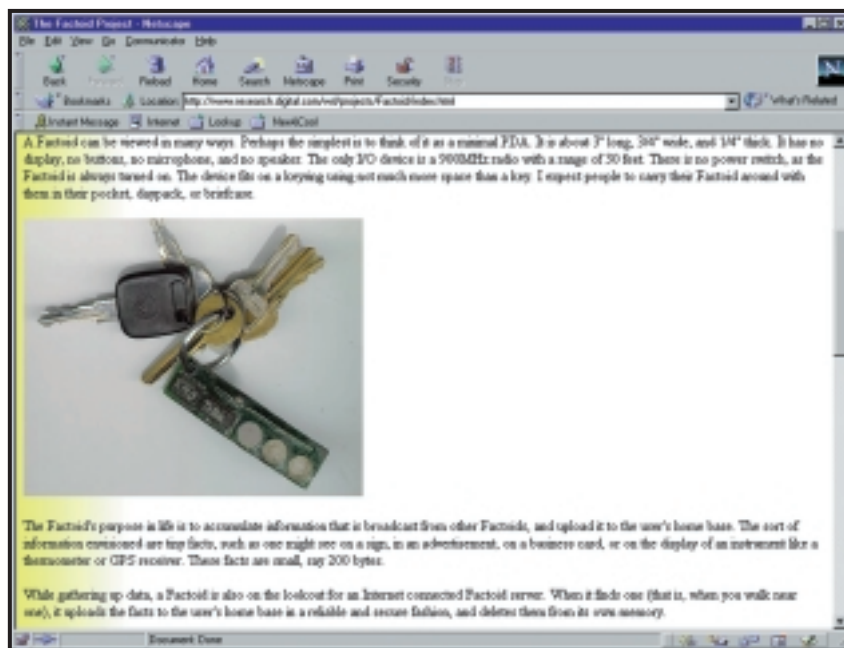
A tiny PC from the Stanford site and yes, that is one of the IBM microdrives just visible on the bottom of the device

understand that each shuttle has lots of tiles, but even so I really can't see this bringing the mass sales necessary to make the wearable computer a commodity item.

But imagine a PDA constructed as a wearable computer and integrated with a phone. You could 'see' all of your appointments, dial people by voice and videocall (or watch a movie) while sitting on the tube. In other words, the functionality of a PDA is, by now, far too well established to consider dropping it. The wearable computer is only ever going to become significant when it gives us that functionality and more. Oddly this seems to have escaped the designers who are concentrating on the more esoteric functionality.

Don't get me wrong, I love the idea of all those extra possibilities as well. For example, www.research.digital.com/wrl/projects/Factoid/index.html (the f of factoid must be typed upper case) envisages a world where the wearable computer collects 'factoids' of data as we walk around (see [screenshot below](#)). These are automatically dumped to a main computer every day so that we have a permanent record of where we have been and what we have done. Factoid or fiction? I don't know, but I do see PDAs evolving into wearable computers in the near future. And that will be the final payback for all those playground taunts.

A prototype factoid device



Balance of power

Manufacturers agree a standard for power supplies, connectors and voltage requirements!! Check the month on the front cover and yes, you've guessed, it's April fool time. But wouldn't it be a wonderful headline?

Since I am a journalist, you may not be surprised to hear that my knuckles drag on the ground from carrying so

Imagine a PDA constructed as a wearable computer and integrated with a phone

much kit but I ascribe this, not to heredity, but to the manufacturers' obsession with permutations on the theme of power supplies. Individual PDAs and other devices are pared down by fractions of an ounce but their power supplies certainly aren't and they are almost never interchangeable. Carrying five different bits of kit means carrying five oh-so-similar-but-ever-so-slightly different power supplies.

For example, I visited some friends recently, taking my laptop in order to do a little work. The work expanded to occupy more than a battery-full of time so after a great deal of searching, a likely power supply was unearthed with the same connector (wow!). My laptop requires 16v and 3.3amps: the power supply offered 15v and 3amps. OK, close enough; I promised myself not to run the

CD-ROM drive to keep the power usage well below 3amps and I plugged in the connector. Or rather, I tried to. The connectors looked the same, but actually differed by about 0.5mm in diameter. Sigh.

I realise that sympathy for journalists is at a low ebb, but surely there are normal people out there who carry some combination of PDA, laptop, modem,

portable printer, digital camera and GPS unit with concomitant power supplies. The whole point of portable kit is surely lost if you have to heave multiple weighty lumpy power supplies around too.

I'm not asking why manufacturers avoid standardising power requirements and connections: to me it seems pathetically obvious that they're tying us into using another of their products. I'd just really rather that they took a different – broader – view.

Solutions? It's possible to buy a single adaptor that puts out various voltages and has a range of connectors (I have two), but even with these it's worth checking that all the output and connector types you need are covered by the adaptor. They also tend to be unpleasantly bulky if you buy one with an output suitable for all devices.

GPS update

After the great re-set of satellite clocks, I wrote in the December 1999 column about how you could retrieve the situation for some Global Positioning Systems by letting them download a new almanac. I did this myself and all went well until I used the unit away from home: it fired up OK but as soon as I started to move, the unit lost track of the satellites it had just found. I think I've cured it of this tiresome habit by leaving it to look at the sky for several hours on end: I don't know if this effected an actual cure or whether it was just chance. Maybe the unit needed time to supplement the new almanac with other information from above. Who knows? If yours shows the same symptoms it could be worth rigging up a power supply (see above) and leaving it to seek heavenly inspiration.



Henry Smith Cw%: Ex%: Sat:

Science 4.1.(a) describe the changes in light, sound or move

1 2 3 4 1 2 3 4 1 2 3 4

LEVEL

Full text of Level Description 4.1.(a) for Science

describe the changes in light, sound or movement, which result from actions such as switching on a simple electrical circuit, or pushing and pulling objects.

1

Sc En IT

Nstore

page up

page down

full text

Next screen

2:10

Mon 10

Henry Smith Cw%: Ex%: Sat:

Science X is a conscientious pupil, who consistently achi

1 2 3 1 2 3 1 2 3

Attai

Full text of Teacher Comment

X is a conscientious pupil, who consistently achieves a high standard in his work.

Sc En IT

Nstore

page up

page down

full text

Next screen

2:10

Mon 10

SCIENCE:

Henry is a conscientious pupil, who consistently achieves a high standard in his work. He has worked steadily, and has improved his skills in many aspects of his work as a result. He is making steady progress in this subject, and needs to maintain his enthusiasm to consolidate this. He has produced some interesting work, but needs to remember to pay attention to detail, and achieve a more consistent standard.

N=Next Page Q=Quit

Nstore

page up

page down

full text

Next screen

2:14

Mon 10

Palm synchronicity

I have complained (whinge) that this column has far too little Palm-related stuff, so I was delighted to hear from David Martyn (David.J.Martyn@btinternet.com).

He has been the proud owner of a Palm III for some time now. However, when he upgraded his email program to Outlook Express 5 (as supplied on the PCW cover CD) he could no longer find a menu option to allow him to set MAPI options. Consequently his Palm would no longer synchronise email.

The good news is that when he upgraded Outlook Express 5 with the latest downloads from the Microsoft site it was suddenly happy to sync with his Palm, totally unprompted. He's happy and wants to pass on to other Palm users the fact that the version of Outlook Express that works in this way is 5.00.2919.6600.

Teachers get help keeping track of children's progress with Nstore

Nstore at school

Meanwhile, back in reality... one of the most novel applications for the Psion I've seen recently is Nstore. You'd never guess it from the name, but Nstore is a record-keeping and reporting package for the National Curriculum. As a writer formerly known as 'Sir', I appreciate the work that's gone into this product and the benefits it could bring to hard-pressed teachers across the country.

Each subject within the National Curriculum is defined by a raft of numbered paragraphs, called Level Descriptions. Teachers are expected (in that copious spare time between lessons) to ensure that their teaching conforms to the curriculum and to track how well every child is performing for each level description paragraph.

Of course, they aren't expected to

'teach' the curriculum paragraph by paragraph, they are expected to teach well-structured lessons and to keep track of which paragraphs have been covered by those lessons.

Nstore contains the entire National Curriculum and allows teachers to search that data for paragraphs relevant to a particular lesson and (after the lesson) to score each child for performance against each paragraph. Reports of pupils' scores can be viewed on screen, printed or exported in a range of formats. So far, so good.

However, Nstore also contains over 750 teacher comments, such as: 'X has had a good year but he/she finds this subject taxing'. The teacher can mark any given child/paragraph combination as worthy of comment. When the report for that child is generated, the program uses the score given by the teacher to choose a relevant comment, personalises it for the particular child's name and gender ('Tracey has had a good year, but she finds this subject taxing') and then prints it.

Too much like automation? Not really, the bank of comments (all taken from actual reports) are only suggestions and can be modified as necessary, and altering an example is usually a quicker process than starting from a blank sheet.

Nstore is available for PCs, Acorn Risc and Psion (3a/3c/3mx and 5). Report and mail merge facilities are invariably better on PC-type platforms so many Nstore users collect data on the Psion and transfer the data files to a PC to generate reports. For registered users of the Psion versions, the PC version costs £29.95, reduced from £49.95; site licences are also available.

The product suffers from some interface inelegance but if my job description was still teacher, Nstore would make me feel less as if it was 'teacher' spelled 'administrator'. The product is, of course, closely targeted at the teaching profession but it's interesting to come across such an inventive and useful role for the Psion.

Further details can be found at www.argonet.co.uk/users/h.s.soft.

CONTACTS

Mark Whitehorn welcomes your feedback on the PDA column. Contact him via the PCW editorial office or email pda@pcw.co.uk



Six steps to security

Roger Gann takes those first, all-important steps in **Internet safety** – ignore them at your peril.

At the moment, for the vast majority of casual Internet users, security isn't a significant problem. This is because most of us use dial-up to access our ISP via modems – we connect, do our Internet business, and then disconnect. We connect at random intervals, for random periods, which makes life pretty awkward for any wannabe hackers. And, just to make their life even more difficult, every time we connect, most of us are given a dynamic IP address, that is, we get a different IP address every single time we connect. So, even if a hacker did cotton on to your IP address and gain access to your PC, they could only do their dastardly deeds during that particular session, 'cos the next time you logged on, you'd be allocated a completely different IP address and they'd have a devil of a job trying to track you down again.

So far so good. But later on this year, the Internet security situation will change for the worse as more and more of us are blessed with Internet nirvana – continuous connections in the shape of ADSL and cable-modem fixed links. This will undoubtedly mean the blessed ones will stay hooked up to the Internet for much longer periods than before and expose themselves to greater security risks, simply because hackers will have more 'working' time to devote to their black arts.

Some users will no doubt leave their PCs on around the clock, listening to web broadcasts or enjoying other bandwidth-hungry tasks that were beyond economic feasibility under the old dial-up regime. These users may not know it, but they'll be running extraordinary security risks. Believe it or not, hacking is actually facilitated by these new technologies.

For example, while DSL networks are switched and users do not share transport media, cable modem networks are essentially LANs: cable users can share a common segment and thus may not only see other users' resource broadcasts but the actual data streams as well. US reports of users being able to browse their neighbours' hard disks have been common.

Now, while it's true to say that in the UK ADSL and cable modem users will also be allocated dynamic IP addresses, which does reduce the exposure to risk somewhat, it's also likely that the 'leases' on these dynamic IP addresses will be relatively lengthy, perhaps as long as 24 hours, which is long enough for a teenager with too much spare time to have a real good rummage about on your hard disk before they lose the connection.

If you think I'm scare mongering, you could do a lot worse than to pay a visit to Steve Gibson's excellent website at <http://grc.com>. Steve wrote the excellent SpinRite hard disk repair utility; he also blew the lid off the Iomega Zip Click of Death problem with his clever Trouble in Paradise diagnostic program. Check out his Shields Up Page and get it to probe your ports – my guess is that you'll be very surprised at what it'll reveal.

OK, that's enough bad news for now. The good news is that you can significantly tighten up your Internet security very easily and at no cost – all you have to do is tweak your network settings. Just run through the following checklist and you'll tighten your Internet security no end. Note that these tips are aimed largely at Windows 9x, which is particularly feeble when it comes to security; Windows NT has a far superior (although not perfect) security model. It also applies to standalone PCs as well as those forming part of a LAN.

Security checklist

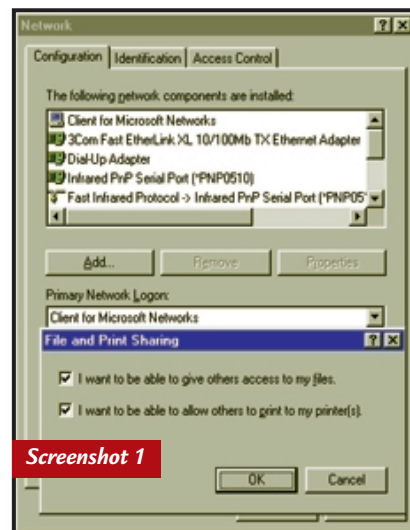
1 Turn off file and printer sharing
This is the very first thing you should do. When the Microsoft networking client is installed, TCP/IP File and Printer Sharing is turned on by default, binding



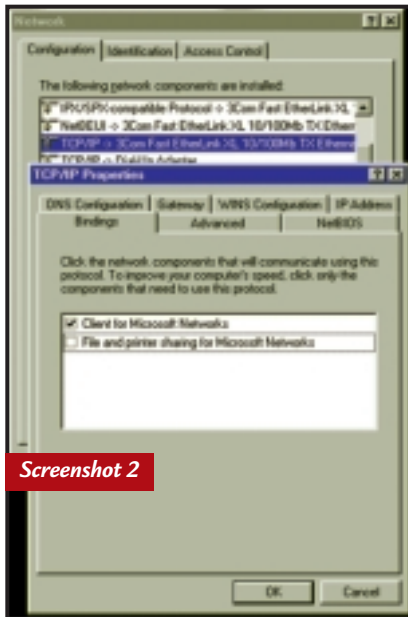
Check out Steve Gibson's website and probe your ports

the NetBIOS protocol to the TCP/IP protocol. This default setting generously extends your computer's file sharing services out across the entire Internet, something you're probably not aware of and you'd rather wasn't happening.

This amounts to a major breach in security and yet Microsoft has only lately seen the light: recent versions of Windows now display a warning message about this when you install TCP/IP. To turn it off, bring up the Properties for Networking, click the File and Print Sharing button and uncheck the two tick boxes (see **screenshot 1**). This kills *all* file and Printer Sharing. However, if your PC is on a network, just turn off File and



Screenshot 1



Screenshot 2

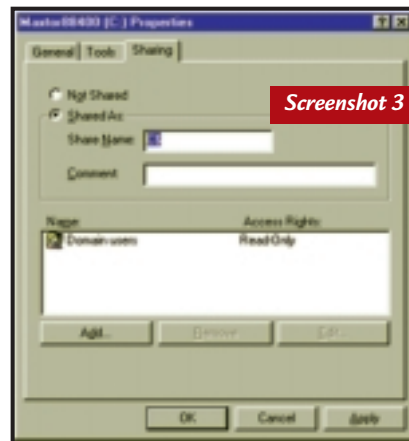
Printer Sharing for TCP/IP – select TCP/IP and click Properties, then uncheck the File and Printer Sharing tick box (see [screenshot 2](#)).

2 Remove the Client for Microsoft Networks If your PC is not connected to a LAN you don't need this client to achieve an Internet connection; it's only required when connecting your Microsoft operating system to other Microsoft OSs. You're strongly advised to remove it: when installed, the NetBIOS file-sharing ports 137-139 are opened and if the Networking Client is bound to the TCP/IP transport (as it is by default), Windows will be broadcasting your user, computer and workgroup names out over the Internet. Useful to hackers but very unhealthy for you.

3 Passwords If you're running a network and must have File and Printer sharing switched on, make sure your network shares are properly password protected. This is particularly important, given that Windows 9x doesn't offer any protection against password crackers or software that bombards your login prompts with a hail of passwords until it finds the right one. They work by using dictionaries (more correctly, lexicons) and run through every word in the list until they hit on the password you're using. By contrast, secure systems, such as NT4, will notify users of failed attempts or completely lock out remote access after a number of password failures. The solution is simple: don't use

real words or proper names but use long strings of mixed alphanumeric characters. I know it's a pain, but if a password is guessable what's the point in having one?

4 Hidden shares If your PC is on a network that has Internet access then you can greatly improve security by hiding your shared network resources using the simple trick of adding a \$ to its share name. This prevents that share from appearing in browse lists – so if you share your Drive C as 'C' it'll be visible, but it'll be invisible if shared as C\$ (see [screenshot 3](#)). OK, this makes browsing impossible for all users, but security never makes life easier. One other thing, please don't use obvious share names either. Simply sharing Drive C as 'C' wouldn't stop many hackers for too long. Better still, share individual folders or files rather than complete drives.



Screenshot 3

5 Bind TCP/IP only as necessary By default, Windows 9x helpfully binds an installed network protocol to every network device. This does help guarantee that a network will work from the start but from a security point of view, it's decidedly dodgy.

Take a networked PC with dial-up Internet access – it'll have a network interface card (NIC) and a Dial-Up Adaptor installed as network devices. Windows 9x will have bound TCP/IP to both of these devices, when strictly speaking it's only the dial-up networking adaptor that requires access to the TCP/IP protocol. By leaving TCP/IP bound to the NIC, it exposes your network to attack from hackers, but by unbinding TCP/IP from the NIC, you limit external intrusion to just that PC.

To do this right-click the Network Neighborhood icon, select Properties

and click on the network adaptor then click the Properties button. Finally, select the Bindings tab and uncheck the TCP/IP box (see [screenshot 4](#)). If you do have cable or ADSL Internet access, you'll have a second NIC installed to connect to that hardware. If you unbind TCP/IP from the NIC, make sure it's the right one!



Screenshot 4

6 Remove TCP/IP from workstations that don't need it If you're running a LAN and some workstations don't have or need Internet access then they don't need the TCP/IP protocol installed. Put another way, only those workstations that access the Internet need TCP/IP. For simple peer-to-peer connectivity good old unrouteable NetBEUI is perfect from a security point of view. If you're running client/server, then resort to IPX/SPX instead.

Last words

These suggestions are just a starting point and other weaknesses in your system security will remain – just about any sort of Internet access is beset with security issues. Loopholes have been found in Microsoft's Personal Web Server, IRC, ICQ, TelNet, web browsers, email readers – the list is endless. You should keep your Windows 9x system as up-to-date as possible by running Windows Update regularly. Next month I'll be keeping the Internet-security fires stoked with a look at personal firewall software.

CONTACTS

Roger Gann can be contacted at the usual PCW address or by emailing:

networks@pcw.co.uk

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Anthony George, Customer Relations Department,
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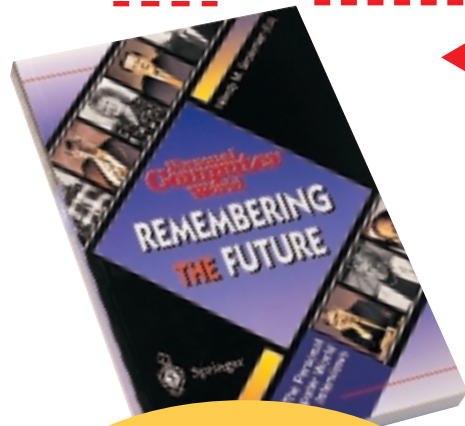
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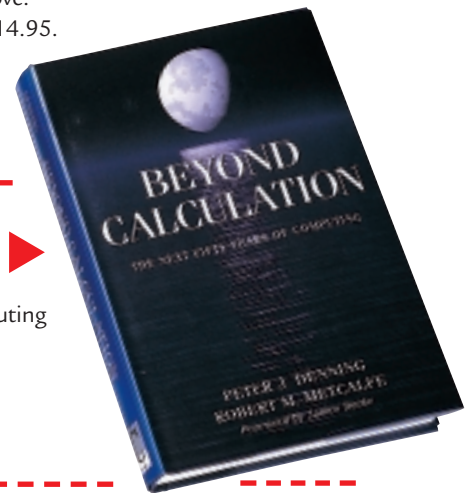
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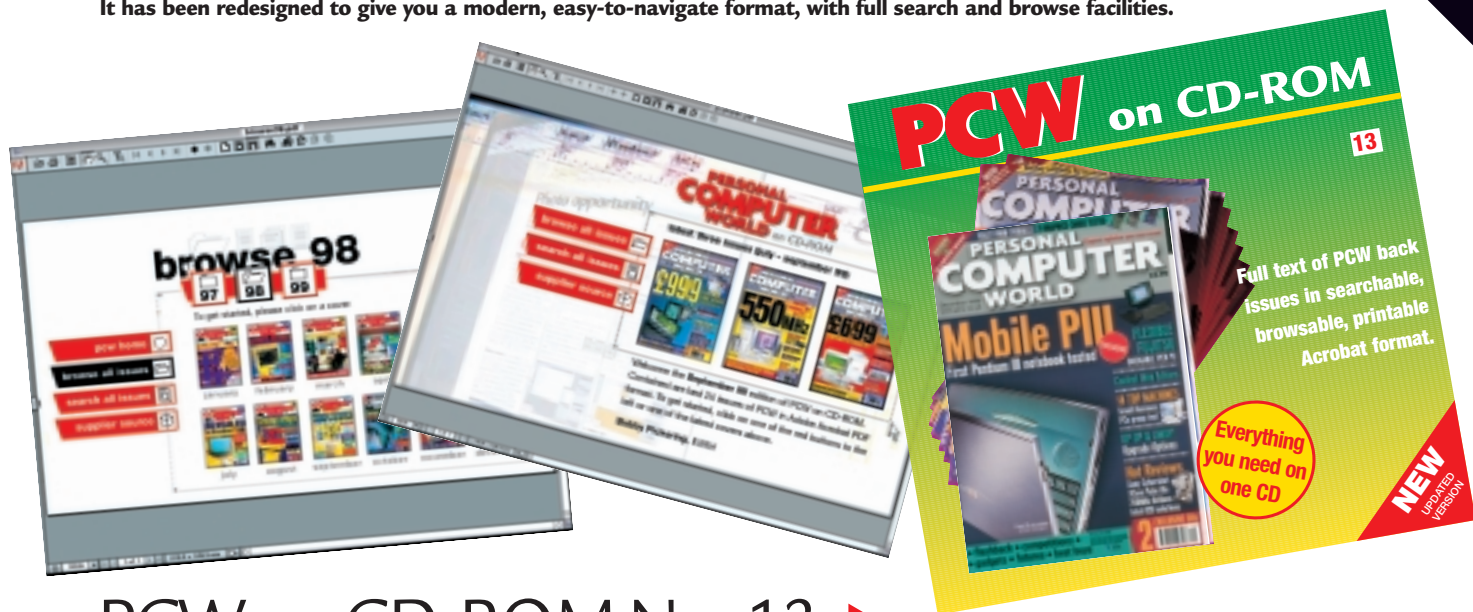
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Starlancer

The big news is that Freespace 2 has a challenger, and it's called Starlancer. PCW was invited to a sneak preview of the work in progress, and we can report that it looks worthy. Chris and Erin Roberts are part of the driving force behind it – the same people responsible for the Wing Commander series.

Although Starlancer is set in the future, World War II influences much of the storyline and gameplay. Earth has been split into a series of alliances vying for dominance over the planets in the solar system; so don't expect to be blowing away aliens for most of the game.

You are a part of the 45th Volunteers Squadron, an outfit that's considered expendable and tends to get assigned the most dangerous missions. This decreases your chance of survival somewhat, so not only will you have to complete whatever mission you've been assigned, but you'll also have to fight for your life.

The 3D graphics in the early code already looked stupendous. The cut



scenes also look pretty good, and we expect a deep, well-developed story to emerge in the final version. There won't be a straight 'win or lose' approach to each level – instead a series of objectives will be present for you to complete. The more of these you achieve, the faster your progress up the ranks will be.

We're particularly looking forward to the multiplayer capabilities. Standard one-on-one deathmatch is promised, but much more interesting is the ability to team up and fight co-operatively over the Internet or your LAN. Starlancer is scheduled for an April release.

www.digitalanvil.com

JASON JENKINS

F1 2000

The end of March should see the release of a new official Formula One game, F1 2000. Developed by Image Space and released through EA Sports, it aims to be as close as possible to the hair-raising real-life experience.

The game will feature drivers, teams, car liveries, advertising and tracks from the Formula One 2000 championship and is timed to be available right at the start of the new season to maximise sales. A photo-realistic simulation is promised with emphasis on accurate car handling and pixel-perfect recreations of the tracks.

EA Sports has gone out of its way to sign some big names to voice the commentary. There's no Murray Walker, unfortunately, but Jim Rosenthal and his European counterparts Jean-Louis

Moncet, Kai Ebel and Ivan Cappelli will make an appearance.

During races, your co-driver will relay information about the approaching track and also keep you informed as to the state of your car and the overall racing strategy. This means that there will be no commentary during each race, enabling you to concentrate on your co-driver.

The good news is that the PC version is being developed separately from the PlayStation version, the idea being that F1 2000 on the PC will be a full simulation, with the PlayStation incarnation more of an arcade romp. We expect there to be a



massive number of options for tweaking your car, which should appeal to the hardcore racing simulation gamer. Doubtless EA Sports will ensure the more casual player is looked after though.

Full force-feedback support is promised, so start saving up for that wheel now as it's bound to be the best way to appreciate the full game.

www.ea-europe.com

JASON JENKINS

Delta Force 2

If you like your first-person shooters **spiced up with a little strategy**, then this could be for you.

The sequel to Novalogic's hit title has lost none of the gameplay that made the original so addictive, and fans won't be disappointed. For those who haven't played it before, Delta Force is basically Quake meets Command & Conquer, utilising the first-person view of the former and the tactics of the latter.

The great thing about Delta Force 2 is that it's playable straight out of the box. After installing, you can simply load up one of the quick missions, check out the keyboard plan in the manual and off you go.

The commands are pretty self-explanatory and the quick missions equip your marine with some decent weapons. Some of the controls could be a more intuitive, though. After placing a Satchel Charge next to a scud missile launcher and retreating to safety, there seemed to be no obvious way to detonate it – and no prompt was forthcoming. It was only by scanning the keyboard layout that we found the detonator, but this could have been toggled for us.

Graphically the game isn't the best we've seen on a PC. Delta Force 2 uses software drivers to run the 3D elements, and this leaves edges looking pixelated – making it look similar to a PlayStation game. There is the option to switch to hardware-driven 3D, but this seemed to make no noticeable difference using an ATi All-In-Wonder card in our test PC.

Strategy is a big part of Delta Force 2 and you'll need to choose your weapons carefully to match each mission brief. After receiving instructions, you get the opportunity to pick the inventory to accomplish that mission. This plays a big



part in whether or not you succeed – if you don't pack enough explosives to blow up all the mission targets, you'll need to rethink.

Caution is usually the best option in the game, and the sniping feature allows you to pick off potential enemies before they become a problem. Bringing up the sight for sniping is reminiscent of the sniper rifle in Metal Gear Solid. You can't defeat everyone in this way, however, and there's still room for those death or glory runs – where you crank your M4 up to full-auto and run screaming at the enemy.

There are also times when you are put in charge of other units to help you complete a mission. Directing them to strategic areas, or using them as snipers to cover you as your forces move in to attack can give you the upper hand.

Logging onto www.novalogic.com to play online took a considerable time, much longer than to log onto a Quake III server using the same machine. This was annoying; the server wasn't full when we went to log in but had been filled by the time we'd loaded all of the map and equipment details.

However, deathmatch games will provide enjoyment long after all the missions have been completed. There is much more of a strategy element to them than with Quake III, and the best ones involve teaming up to fight against other groups and complete a mission. The Voice-over-Net feature lets you talk to other players and keep in constant contact, so you don't have to stop and type a message.

Basic deathmatching itself is also different, with points being scored for how a kill is performed. A head shot will get you two points, while the real pros will be unsheathing their knives and

looking for three points. In team death-matches you'll want to avoid killing your own soldiers and incurring the minus four points penalty – not to mention their wrath.

Novalogic has come up with a sequel that has developed the original in many ways. Although it has its minor problems, it's now more playable and addictive than ever.

MATT CHAPMAN

DETAILS
★★★★★

PRICE £34.99 inc VAT

CONTACT Novalogic 020 7405 1777

www.novalogic.com

SYSTEM REQUIREMENTS Pentium II 400,
64MB of RAM, Windows 95/98/NT



Imperium Galactica II

With real-time strategy, and **eye candy galore**, here's the next generation of space sims.

Imperium Galactica II sits somewhere between strategy and sim, hoping to be the real-time, 3D pioneer that bridges the gap between the genres.

Visually it's superb, sporting Digital Reality's powerful 3D engine, and the splendid cut scenes, coupled with a spine-tingling soundtrack, lead you to believe you're in for a treat of stellar proportions.

You take on the role of one of three races: humans, the war-like Kra-hen or the wily Shinari, and must explore and expand your empire throughout the universe, using a variety of tactics. Simply waging an all-out war won't get you far. You will have to become adept at diplomacy, trading and espionage, as well as researching new technologies and designs as you colonise planets and build your forces.

With so many options and variables, it's about as intuitive as being at the helm of a space shuttle, and we often found ourselves returning to the helpful tutorial to work out what we were supposed to be doing, and how.

Your main screen is the star map, in 3D and viewable from any angle, upon which are the planets of your empire, your fleets of spacecraft, unknown planets and any other objects, such as pirate ships or trade vessels, that enter your radar zone. You can zoom in and out on these which gives the worrying feeling that the universe is full of burgeoning empires about to encroach on your own.

The next step is to colonise a planet. This is where the 3D graphics really come in. First, you need to build a colonising ship and then zoom down to the surface to build a hub. After this, you're well in to constructing your space city.

All the usual sim stats are here – build parks and hospitals to keep people happy and squeeze them for tax, make

sure they have a decent power supply, and make them work in your research facilities and spaceship factories, increasing your military might. Don't forget to keep an eye on crime and build some trade and defence structures, as you won't want to be left helpless if you're attacked.

To interface with the rest of the universe you need to look at the various

The space battles look great, but once you lock your fleet onto the enemy, it's sit back and roll the dice time. The

game works out who's going to win, and you are relegated to a spectator – zooming in and out of some pretty 3D visuals of the skirmish, but having little control over its development. You don't get the feeling you've led your troops into

battle, as with Command and Conquer-style games, and, once you've built up a formidable force, that comes as a bit of a disappointment. Victory ensures a pride-swelling video message, and maybe extra kit or another mission to undertake.

For those who prefer the underhand approach there's always the espionage option. Again, this depends on factors such as your spies' skill levels and the time you allow them to complete their missions.

Imperium Galactica II is beautifully presented, but it depends on what you want from it. If you're a fan of hands-on strategy, then those extra things to consider, such as your citizens' morale, probably won't make up for the loss of combat control. For those from the sim fold, it's a big step forward, the 3D environments are totally immersive and, if you're prepared to invest the time, it will prove hugely rewarding.

MATT WHIPP



video messages, telling you of developments that need your attention, such as a virus-carrying terrorist ship about to wreak havoc on your planets. Once you've decided on a course of action, you'll have to deal with the consequences. It might involve hurriedly-built hospitals and a respite in taxes, or it might be time to dust off the destroyer and have a pop at those pesky terrorists.

DETAILS

★★★★★

PRICE £34.99 inc VAT

CONTACT GT Interactive 020 8222 9700

www.imperiumgalactica2.com

SYSTEM REQUIREMENTS Pentium 233

(Pentium II recommended), 32MB RAM (64MB recommended), 3D card, Windows 95/98

Battlezone II

Now you can have **the control of tactical commander**, and still be in the thick of the battle.

The first instalment of Battlezone received rave reviews. It was a truly revolutionary moment – imagine a real-time strategy game such as Command and Conquer and then imagine being right in the thick of the action and you've got the Battlezone concept.

You are in control of your troops as before, but you don't have the advantage of an aerial view. This means that not only do you have to worry about attacking the enemy personally, but you also have to concern yourself with developing your resources and ordering your teammates around.

Unfortunately, this concept didn't catch on, and the title suffered from poor sales. Despite this, developers Pandemic decided to push on with a sequel. The result is a game that has stayed true to its roots, but has enough changes incorporated into its structure to make it significantly different to what went before. The changes may annoy fans of the original, but they should also increase its accessibility to Battlezone virgins.

You spend much of the game in your hover tank, flying around the landscape issuing commands and firing at the enemy. You can also hop out of your vehicle, however, and roam about on foot where necessary. If your hover tank gets destroyed, you'll be blown out of it and forced to take your chances on foot. You can choose to jump straight into the action using the instant play facility – or take the more linear, plot-driven missions. The latter type of mission sees you take a position in the newly formed ISDF: a coalition force formed between the two warring factions at the end of the previous instalment. Your enemy is the alien race the Scion.

The first few missions see you following your commander around while you learn how to navigate the Battlezone II universe, how to issue orders and so

on. After this you get to control your own destiny, although if you want to concentrate on the resource-management side of things, you'll often



find yourself called away on missions that require you to act on your own rather than

order your underlings around. This could irritate devotees of the original, but is an example of the sort of changes that have been made to attract a wider audience.

One of the other most noticeable changes concerns the graphics. These have been improved upon dramatically and look stunning on a highly specified system. Another welcome change is the much improved user interface that allows you to issue commands much more easily. You can still use the old 'line-of-sight' option if you want, but you can also use the handy new series of keyboard shortcuts.

Pandemic has made much of the improved AI in the game, but there are still problems with it. One of the most irritating is that your units seem to be incapable of finding a sensible path through the battlefield. If you want a vehicle to come to you, for example, it will take the easiest, shortest route, even if that's straight through the middle of a battle.

To get round this, you have to use waypoints to guide it round the explosions. This would not be a problem if Battlezone II were a traditional RTS game, but when you are on the ground in 3D land, surrounded by loads of violent aliens intent on your destruction, it's not quite as easy.

Battlezone II also has the bonus of a multi-player facility. Our version of the game had some problems, but by the time you read this Pandemic should have completed work on a patch to fix them. The standard capture the flag and deathmatch options are here, and you can also play multi-player versions of the single-player strategy games.

Overall it's not quite the triumph we were hoping for, but despite its few problems it's good to see

that there's still a lot of life left in the Battlezone format.

JASON JENKINS

DETAILS

★★★★

PRICE £34.99 inc VAT

CONTACT Activision 01895 456 700

www.pandemicstudios.com

SYSTEM REQUIREMENTS Pentium 200, 32MB RAM (64MB recommended), 4MB DirectX 6 compatible 3D card, DirectX 6 compatible sound card, Windows 95/98

Slave Zero

Mindless robot battles, as complicated as your **metal-clad opponents**, are still as fun as ever.

Forget your complicated, intelligent games that require you to read a manual five inches thick. *Slave Zero* is utterly one-dimensional, uncomplicated, arcade fun. The setting is the future where a city is controlled by an evil dictator who maintains his grip using a set of robots. The *Slave Zero* of the title is a giant robot that you control in an attempt to bring an end to the dictator's rule.

Essentially, this gives you an excuse to rampage through the city King Kong style smashing everything in your path to pieces. You have to fight against a motley crew of similar-sized robots, helicopters and annoying drones that you can simply step on to kill. The robot is truly huge, and to give you a sense of its scale there are loads of tiny cars and people moving about beneath your feet, which you can step on or shoot at if you're feeling grumpy.

The 3D environment is respectable. The game doesn't have the best graphics we've ever seen with some of the textures looking slightly blocky, but it's not a huge issue as the focus is more on arcade-like fun than on pixel-perfect realism. One problem, however, is the fact that the view automatically shifts from third person to first person when your back is against a wall. This is fine when you're just walking around, but it's a bit disconcerting when you're in the middle of a battle.

Each of the 15 levels unfolds in a strictly predefined fashion – there's no wandering off to explore the map in this title; you have to go where you're told. Each step you take is accompanied by a loud crashing thump that befits your massive frame. You have a choice of weapons that work best on different types

of foe. We quite liked the rocket launcher to take out the similar-sized robots, but there's also a scattergun that works quite well on approaching helicopters. Sometimes it's best to forgo the weapons altogether and just stamp your feet – as you're so large this does quite a bit of damage to the surrounding area.

The best way to control the robot is

You can save the game at any point though, so it's something that you can dip into now and again without having

to spend hours playing, only to die just before you reach the target. At the end of each level is the arcade favourite, the big baddy. The more you progress, the bigger and badder they become until they completely dwarf you.

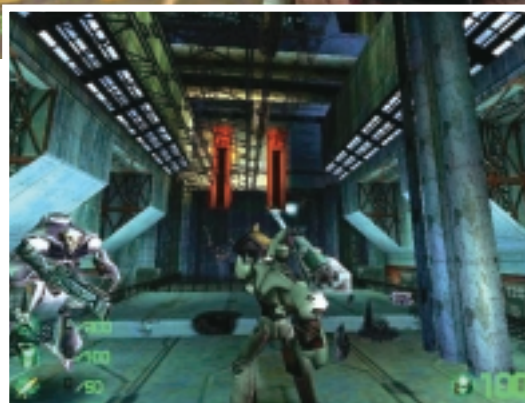
Considering how large you are to start with, that's quite a lot of robot you've got to take out.

Once you've played it a few times, you'll soon pick up on the standard movements your opponents make and be able to wipe them out without too much bother. They are not particularly intelligent – it's normally best just to charge in and fire, and use the strafing controls to try and dodge any incoming fire. If you do run into problems, it will probably be more to

do with the sheer numbers facing you rather than any devilish new tactics from your enemy.

All in all, it's not really a game for anyone who loves to spend hours working hard to get to grips with loads of hidden subtle options and commands. Although there are a few minor things wrong with it, if you feel like dipping into a mindless, fun, arcade romp, then *Slave Zero* fits the bill exactly.

JASON JENKINS



using the mouselook function combined with the keyboard. You can then fire your weapons using the standard left and right mouse buttons for primary and secondary fire.

Each of the levels is typically divided up into three sections that you have to complete in order to progress to the next. Should you die, you go back to the start of the particular section you are on.

DETAILS

★★★★

PRICE £34.99 inc VAT

CONTACT Infogrames 0161 827 8000

www.slavezero.com

SYSTEM REQUIREMENTS Pentium 233, 64MB of RAM, Windows 95/98

Legal wranglings

There were once two students of law, Jim James and Bob Roberts. Being students, it wasn't long before Bob found himself a bit strapped for cash, but his wealthy friend Jim James agreed to lend Bob £5,000, which he said Bob could pay back whenever he won his first case.

They graduated to the Bar and Jim soon prospered as a successful lawyer. However, it soon became obvious that Bob wasn't doing quite so nicely. In fact, two years down the line he had yet to appear in court. This meant that Jim had not had any of his £5,000 loan returned. Eventually, things came to a head and Jim took Bob to court over the debt.

On the day of the trial they both met outside the courthouse and greeted each other warmly. Bob was convinced there

was no way he would have to pay back the money, and Jim was equally sure that his money would be returned. How could they both be so certain?

Find the solution and you could have a chance to win a mystery prize. Send the solution, your name, and an address where the prize can be sent on a postcard to: PCW Prize Puzzle (April 2000), VNU House, 32-34 Broadwick Street, London W1A 2HG or by email to: letters@pcw.co.uk. Answers should arrive no later than 20 March 2000. Please note we DO NOT open attachments.

Winner of January's Prize Puzzle

The usual easy number crossword attracted over 200 entries - mostly by email. The solution is given below and the winning entry came from Graham Rolph of Worthing, Sussex. Congratulations Mr Rolph, your prize (a

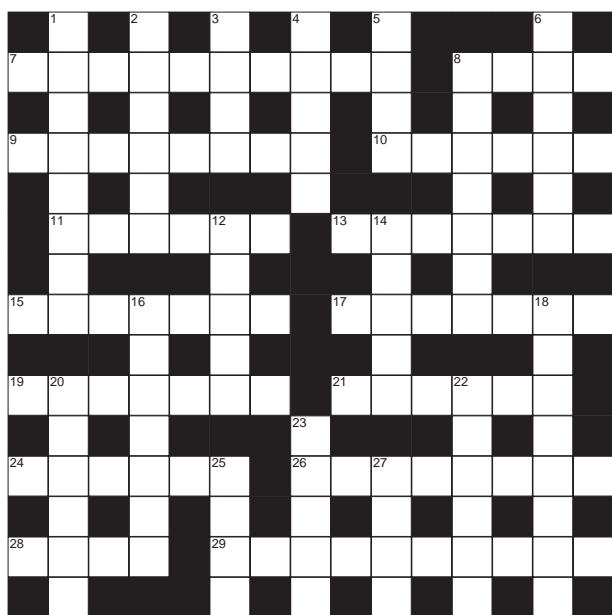
beautiful Sheaffer pencil - for the benefit of all those readers who've asked what the prize is) is on its way.

Goodbye to all of you, especially the regulars - it's been 20 years of fun. And don't forget the website if you'd like to keep in contact:

www.jj.clessa.dial.pipex.com

6	3	1	5		7	9	2	1	
3	8		3	6	5	2		7	7
7		8	3	1	3	6	1		6
	7	8		6	7		3	8	
	8	6	2	5		8	2	7	4
	7	9	9		7	0	7		6
5	5	4		4	1	5		5	2
6	7	0	5		8	7		7	2
5	2		6	9	6	5	5	6	
0		7	8	1		7	8	2	9

prize crossword



ACROSS

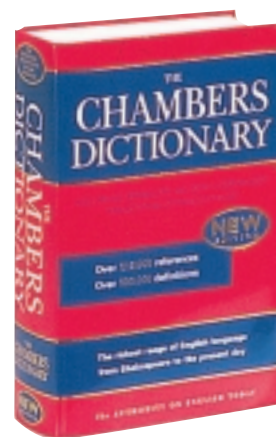
- 7 Reduced in memory size (10)
- 8 Online talk (4)
- 9 Period when a computer is unusable (8)
- 10 Bleeps indicate them (6)
- 11 Machine running a network (6)
- 13 Brings in data (7)

- 15 Common type of 17 Across (7)
- 17 Digital image device (7)
- 19 Actively deal with data (7)
- 21 Put files into it (6)
- 24 VDU (6)
- 26 An .ac suffix indicates this web status (8)
- 28 People who have

- visited a site (4)
- 29 The T of IT (10)

DOWN

- 1 Vast (8)
- 2 Bottle-top remover (6)
- 3 Abominable snowman (4)
- 4 Wedding official (5)
- 5 Lazy (4)
- 6 Orange root crop (6)
- 8 Drawn animation (7)
- 12 Short odds (5)
- 14 Old, little computer (5)
- 16 Entry vouchers (7)
- 18 Items of jewellery (8)
- 20 Shrink back (6)
- 22 Resides (6)
- 23 Spring month (5)
- 25 Memo (4)
- 27 Princess Royal (4)



Each month, one lucky PCW Crossword entrant wins a copy of the new Chambers Dictionary. The winner of February's puzzle is: Alan Sherratt of Warrington, Cheshire. This time, it could be you. Send your completed crossword to: 'PCW April - Prize Crossword', VNU House, 32-34 Broadwick Street, London W1A 2HG, to arrive not later than 20 March 2000. Please state clearly on your entry if you do not wish to receive promotional material from other companies.

Solutions to March's crossword

- ACROSS
 7 Point 8 Chat 9 Open 11 Device 12 Floating 13 Home 15 Pin 16 Alias
 19 Refresh 20 Corrupt 23 Basic 25 VGA 26 Font 28 Computer 30 Cursor
 32 ADSL 33 Load 34 Reply
- DOWN
 1 Love 2 Engineer 3 Chafing 4 Stool 5 Mortal 6 Seen 10 Tempest 14 Opera
 17 Aspen 18 Monarch 21 Referred 22 Overeat 24 Impels 27 Stall 29 Odds 31 Oils

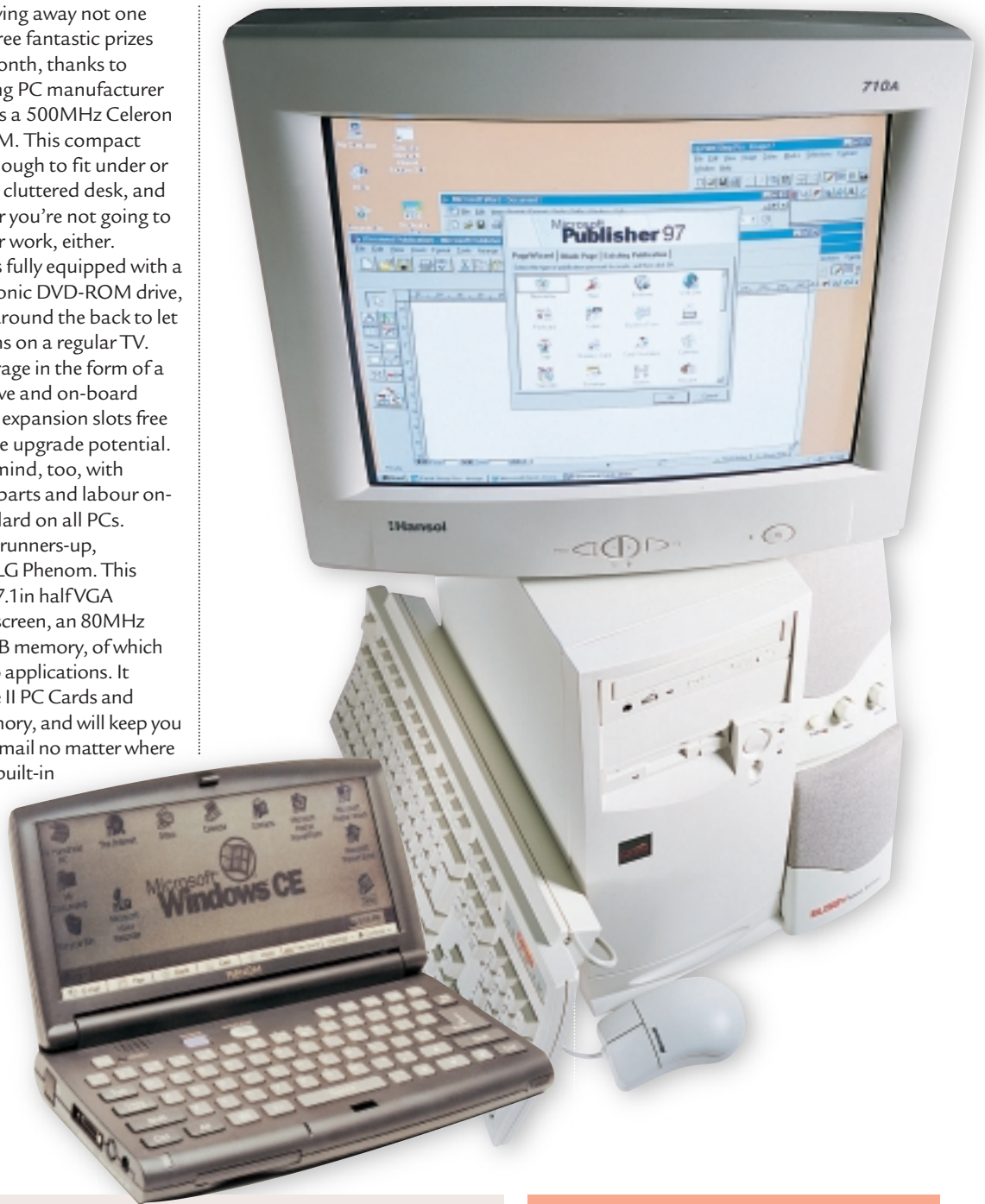
WIN a great Carrera package

We're giving away not one but three fantastic prizes this month, thanks to multi-award winning PC manufacturer Carrera. Top prize is a 500MHz Celeron PC, with 64MB RAM. This compact machine is small enough to fit under or onto even the most cluttered desk, and with a 17in monitor you're not going to be squinting at your work, either. As you'd expect, it's fully equipped with a modem and Panasonic DVD-ROM drive, and a TV out port around the back to let you watch your films on a regular TV. There's bags of storage in the form of a 12GB IBM hard drive and on-board sound to keep your expansion slots free and maximise future upgrade potential. You'll get peace of mind, too, with Carrera's two-year parts and labour on-site warranty, standard on all PCs.

Each of our two runners-up, meanwhile, win an LG Phenom. This handheld PC has a 7.1in halfVGA (640 x 240) colour screen, an 80MHz processor and 16MB memory, of which 8MB is given over to applications. It takes standard Type II PC Cards and CompactFlash memory, and will keep you in touch with your email no matter where you are through its built-in 21.6Kbits/sec modem.

■ For the chance to win yourself one of these fab prizes, simply tell us which of the four English words below is the literal translation of the Spanish word 'Carrera'.

1. Flag
2. Race
3. Best
4. Computer



How to enter the competition

Write your name, address and daytime telephone number on a postcard or the back of a sealed envelope. Mark your card 'PCW/Carrera competition' and send to the following address by 31 March 2000:

Personal Computer World
Building 960
Sittingbourne Research Centre
Sittingbourne
Kent ME9 8AG

◆ Competitions are open to residents of the UK only.

Rules of entry

This competition is open to UK readers of *Personal Computer World*, except for employees (and their families) of VNU Business Publications and Carrera.

The Editor of *Personal Computer World* is the sole judge of the competition and his decision is final. No cash alternative is available in lieu of prizes.

A look back at the ZX80 debut, the birth of the CD-ROM, and Commodore's gloomy future.

20 YEARS AGO April 1980



The cover claimed a double first in relation to Sinclair's ZX80 – 'Sinclair makes it, PCW tests it.' Sinclair's idea behind the machine was to produce an easy-to-use computer

that would run BASIC and break the sub £100 price barrier. The ZX80 was available in two flavours: £79.95 for a bits and pieces kit that you could assemble yourself; or for an extra £20 Sinclair would even screw it together for you. On top of this you'd also need a power supply, that would cost £8.95 if you wanted the official version. To get a picture from the machine you needed to hook it up to your TV set and getting data in and out was done via a standard tape recorder. Our reviewer David Tebbutt concluded that he 'hoped Mr Sinclair and his merry men of Cambridge can cope with the expected flood of orders'.

We also looked at viewdata, which offered 'the means of bringing into every home remote access to a large information retrieval database with interactive facilities'. Dr Adrian Stokes explained that the Post Office had trademarked 'Prestel' as the implementation of viewdata, since 'Viewdata' was too descriptive and a trademark could only be applied to a generic term. Viewdata worked using a telephone and television in tandem. The phone connection would request the information which would then be displayed on the TV, transmitted with the Teletext information (in much the same way as satellite delivery of Internet content is available today).

15 YEARS AGO April 1985



The Acorn Business Computer (ABC) graced our cover in 1985 – and we had one of the first machines to put through its paces in our benchtest.

However, the ABC was under much greater scrutiny, following the news that Olivetti had bought 49.3 per cent of struggling Acorn, with an option to increase its share to 50.1 per cent. Faith in Acorn was non-existent as far as the city was concerned and its machines – including its flagship product the BBC Micro – weren't selling well.

The model we reviewed – the 310 – was top of the ABC range and based on the Intel 80286 processor. Our reviewer, Peter Bright, found it to be 'technically fine' but the large machine and monitor made it a real desk-filler, and it was exceptionally loud ('it drove me mad').

Elsewhere, excitement was growing over the possible use of compact discs to hold computer applications. Audio CDs had been on the market for four years, but so far no-one had taken advantage of the 540MB of data storage. Even the drives themselves, currently under construction by Sony and Philips, had not been seen yet and as Paul Groves admitted: 'Here we enter the realm of speculation'.

These still being the days when you could type in something for your entertainment, program of the month was Ice Cream Vendor for the BBC by Jes Phoenix. A game masquerading as a way to teach kids about business, it was billed as 'a good way to bring out the capitalist in your child at an early age!' With almost six pages of (very small) code to type in, it must have been a nightmare to find any mistakes that kept it from running.

10 YEARS AGO April 1990



In addition to boasting about being the 'Technology Journal of the Year' April's PCW looked at TextPro, a hypertext system, ReadRight, an OCR package that could

recognise fonts, and Nick Hampshire had a dig around the computer graveyard at PCs that failed.

Ever since Vannevar Bush wrote an essay entitled 'As We May Think' in 1945 describing a machine he envisaged called the Memex, people have been trying to realise this machine. One key feature of the Memex was that it allowed you navigate through a mass of information. Hypertext, now seen most prevalently on the web, took us one step closer to this vision. In 1990 there were already many established hypertext systems available although they were very graphical in their approach. TextPro offered a more simple textual format. While TextPro was easy to use, Nelson Taylor noted that: 'One basic problem with hypertext is the tendency to get lost within the maze of text layers... a graphical mode reminding the user precisely where he or she is located at any one time would be a useful addition.'

Down in the PC graveyard, Nick Hampshire mourned the loss of the Altair, Commodore, Tandy and Apple. Of course, as we know now, Apple is making a good comeback with the iMac and G3/G4 range. Commodore, on the other hand, was not so lucky; after the demise of the PET, C64 and C128 Commodore looked like it had something with the Amiga. Unfortunately, this was just a minor blip and Commodore never really recovered. The Amiga, though, looks like it may have a brighter future. Until recently, the rights to Amiga were held by Gateway, but it failed to really do anything with them. Gateway has now sold the rights to Amino, so as to whether the Amiga can rise again, only time will tell...

5 YEARS AGO April 1995



A decade on from a time when CD-ROMs were mere speculation, the technology entered a new era, with the birth of quad-speed drives. We had eight examples going head-

to-head in our group test – and with high-street prices as low as £135, these early models were as tempting for the average consumer as they were for techies.

Ironically, our news section profiled the struggle to find a successor to CD-ROMs, in a story headlined 'Giants fight over CD's undug grave'. Sony, Philips, Toshiba and Time Warner were all looking at ways to extend the 640MB limit of a CD, in an effort to carry a full-length feature film. The successes they had already shown were undoubtedly the first working examples of DVD technology.

The *Sound* column made its debut in *Hands On* five years ago this month (happy birthday!), and Steven Helstrip was captaining the ship to give the low-down on Goldstar's Procyon sequencer. He was also on hand to give his opinion on 15 sound cards in our group test. Currently an office favourite for sound technology, Creative's offering was the AWE-32+. This was beaten by Aztech's SoundGalaxy Waverider 32+, but 'came close, offering slightly more features, but [was] costly in comparison'.

PCW was also doing its bit for 'charidy mate', with an encrypted Comic Relief screensaver on the cover disc, that could be unlocked for the very generous donation of £7.99.

MATT CHAPMAN AND WILL HEAD

Commodore VIC-20

Don't hang your heads in shame, VIC-20 owners, you had a computer with specs to be proud of.

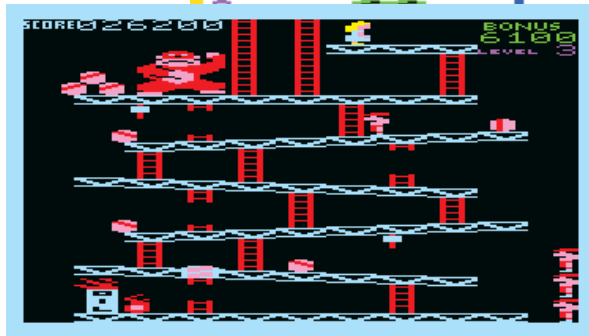
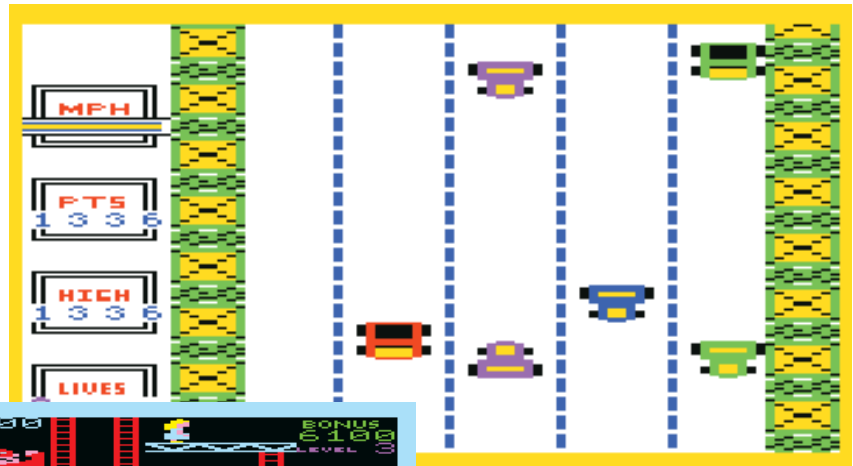
With the sheer volume of Sinclair and Acorn computers sold in the early Eighties, you'd be forgiven for remembering UK manufacturers as dominating the pioneering years of British home computing. Think again: hailing from the good old US of A, Commodore Business Machines, CBM, was also a force to be reckoned with.

Commodore was originally founded by Jack Tramiel as a typewriter repair firm in 1954. Tramiel was to become a huge name in computing, but his company was also home to another legend: Chuck Peddle, designer of the 6502 processor and the Commodore PET that first housed it. We reviewed the £700 PET 2001 back in the second issue of *PCW* in 1978 – the machine boasted an all-in-one design, incorporating a 9in display, cassette drive, keyboard and between 8 and 32KB of RAM. The PET was very much a personal computer, designed for business and, like the Apple II, enjoyed the success of running VisiCalc, the world's first spreadsheet application.

But this tale isn't about the Commodore PET; it's about the VIC-20, a machine designed for home gaming. Legend has it that Chuck Peddle expressed surprise that Tramiel wanted to

make a colour machine as, after all, the B in CBM stood for Business.

Stories as to why Commodore went down the consumer route vary, but many are based on its Video Interface Chip, designed in the late Seventies for use in third-party video games. It is said that lack of external demand persuaded Commodore to design its own computer around it. Thus, the VIC-20 was first unveiled at a 1980 US computer show as



The blocky graphics may look second rate by today's standards, but the VIC-20 was home to some great arcade conversions

the MicroPET, but hit the retail shelves on both sides of the Atlantic in early 1981, sporting its new name. The VIC took its name from the Video Interface Chip, but no-one seems certain where the 20 came from. Unlike its later brother the CBM-64, the number 20 had nothing to do with memory. For the record, the VIC-20 housed an 8bit 6502A CPU beating at 1.0227MHz, a 16KB ROM, and a mere

3.5KB of user RAM (expandable to 32KB). The VIC-I chip (labelled 6560 and later 6561) drove the display at an impressive 176 x 184 pixels in up to 16 colours. Audio was particularly well-handled with one white noise and three tone generators.

Unlike the British-made home computers, Commodore's VIC-20 and CBM-64 weren't interested in talking to just any old cassette deck – instead you

were forced to buy a dedicated model, but at least the host computer had basic control over the transport. The VIC-20's 6522 Versatile Interface Adaptor (VIA), handled external peripherals, including a proper Atari-style joystick port and the Datasette tape drive. A disk drive and printer were also available as options.

With the technically-superior CBM-64 just around the corner, many people later mocked the VIC-20, but if you put it next to, say, its Sinclair competitors you could instantly see it came from a serious background. The 404 x 204 x 74mm case boasted a full-size keyboard, and the technical specs were just that bit superior to many other systems at the time. Okay, it cost around £200, which was more than double that of Sinclair's ZX81 released in the same year, but the US system was almost incomparable. Just looking at the superb arcade clones revealed VIC-20 software to be much richer than anything else at the time.

Alas, for the VIC-20, Commodore released its technically-superior CBM-64 in 1982. We didn't get to see many 64s in the UK until the following year, but the VIC's fate was sealed. As the 64 went on to battle the ZX Spectrum in the school playground, the VIC-20 became an embarrassment to kids whose parents were early adopters.

Well I'd like to set the record straight: I too may have mocked the VIC in my schooldays, but if it hadn't been so quickly superseded by its parent, I truly believe it would hold a very precious place in the hearts of retro-philas.

GORDON LAING